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Implement & Tractor

Magazine of the farm and industrial equipment industry

NOVEMBER 1985

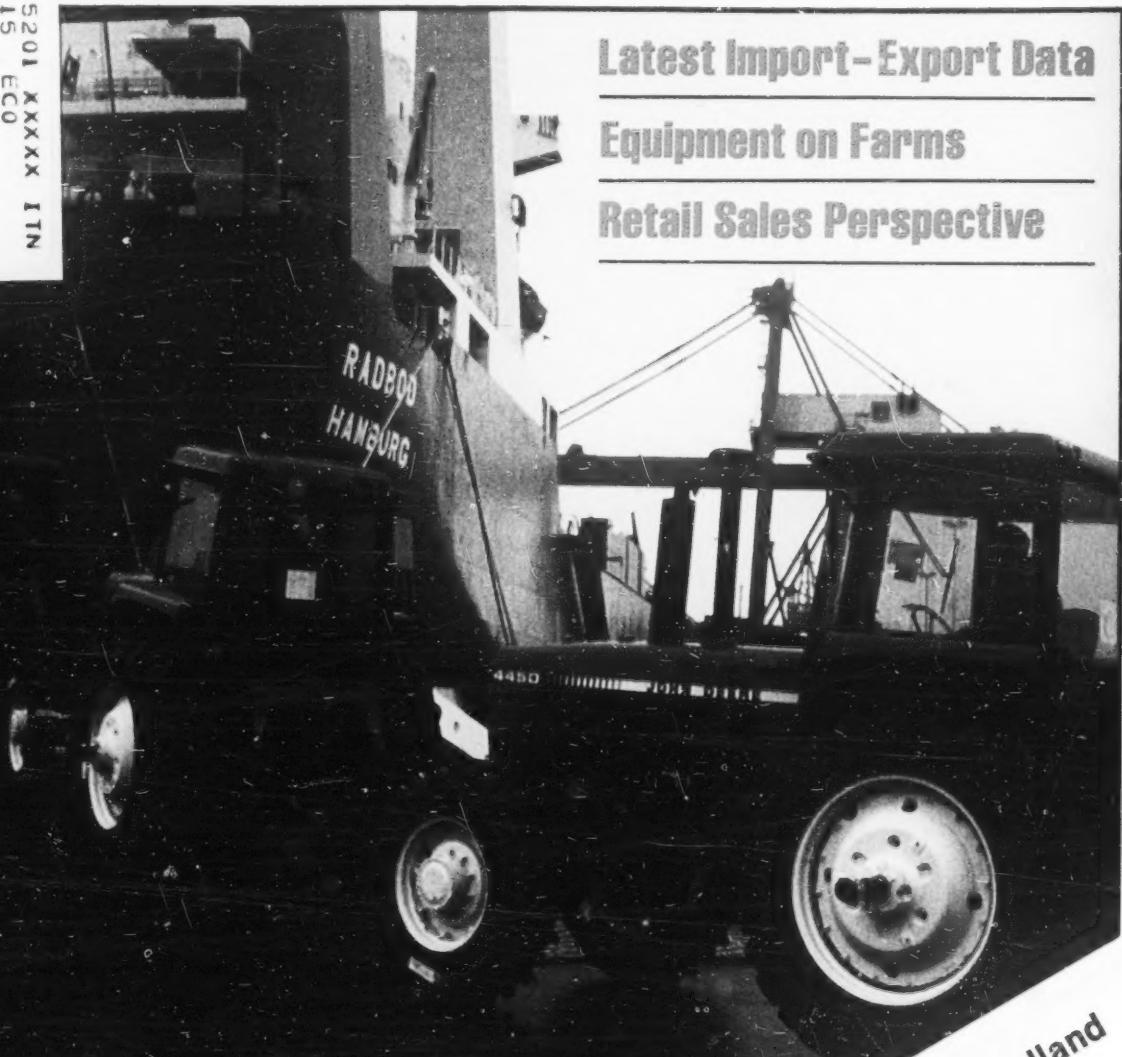
48th Market Statistics Issue

Latest Import-Export Data

Equipment on Farms

Retail Sales Perspective

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Ford Acquires New Holland
page 4

IMPLEMENT & TRACTOR

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48th Annual Statistics Issue

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- 8: **FIEI Convenes.** At the annual convention, held in Vancouver this year, the ag outlook was "more of the same," the industrial forecast was "steady, strong."
- 38: **Tractor Fuel Economy Ratings.** Last installment of a three-part series that shows how tractors did in various Nebraska tractor tests.
- 42: **Case Upgrades Tractors, Combines.** A new "constant drive" model tractor and a new combine series are announced by Case International.
- 43: **FDO Report: Dealers and Their Associations.** Results of I&T's August For Dealers Only survey might provide some guidance for association convention planning committees.

On the cover...photo courtesy of Deere & Co.

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I&T Update

The Ford-Sperry New Holland Deal: Some Dealers, Marketers Comment



The Oct. 10 announcement by Ford Motor Co. that it will buy the New Holland assets of Sperry Corp. brought to an end years of speculation and false alarms concerning New Holland.

Donald E. Petersen, Ford's chairman, said his company will pay Sperry approximately \$330 million for the assets, including receivables, facilities throughout the world and trademarks, and assume \$110 million in liabilities.

The transaction is subject to getting anti-trust clearances from the U.S. government, which will probably take until the end of the year to be wound up, according to a Ford spokesman. In addition, the acquisition includes operations and properties in other nations

in which approvals are necessary. Ford Tractor, based in Troy, Mich., has tractor production units in Belgium, France, the United Kingdom and Brazil, as well as in Romeo, Mich. Sperry New Holland has production facilities at its headquarters in New Holland, Pa., at Mountville and Belleville, Pa., Grand Island, Neb., and in Brazil, Belgium, France and Australia.

(On Oct. 24, New Holland advised employees at its Lexington combine plant that its closing last June will be permanent. As soon as tooling, materials, etc., can be transferred to the Grand Island plant, where the company makes headers and other equipment, combine produc-

Tell Us What You Think!

Your view of the Ford buyout of Sperry New Holland is important. Please take a moment and jot your thoughts on the special postage-paid survey form inside the front cover of this issue. I&T will report the results of that special reaction survey early next year.

tion will begin.)

Ford Tractor Operations had worldwide sales in 1984 of \$1.25 billion. In the fiscal year ended Mar. 31, Sperry New Holland had sales of \$715 million. Its profit, before interest, taxes and corporate expense was \$34 million in 1984, down from 1983's \$72 million and the \$169 million peak of 1980.

Petersen said, "Ford contemplates no immediate changes, including no major changes in the New Holland product line. Over time, of course, we will look for ways to improve both organizations while taking the needs of employees, dealers and customers into full consideration."

The *Wall Street Journal* quoted a Ford official as saying that "down the road, there will be a consolidation of dealers."

Ford Tractor has approximately 1,400 franchised dealers in North America. There are about 1,800 dealers handling Sperry New Holland lines, and about 400 of the Ford dealers are included among them. Most New Holland dealerships also represent one or more of the major North American tractor lines, and there are about 60 New Holland company-owned retail stores.

Sperry New Holland does not have conventional written franchise agreements with its dealers, except for its line of skid-steer loaders. Dealers and the company sign sales contracts, which set out terms and conditions of payment, and on the back of these contracts the company states what is basically expected of the dealer. According to a Sperry New Holland spokesman, when the terms of existing contracts are

(Continued on page 10)

U.S. Retail Sales: September a Downer

Unit retail sales in the U.S. were down in September for all product categories except tractors under 100 hp. The strength

of sales of tractors under 40 hp, all imports, put the over-all tractor sales total on the positive side.

	Unit Retail Sales — September —			— January-September —		
	1985	1984	Pct. Change	1985	1984	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	4,393	3,499	+ 25.6	46,177	40,163	+ 15.0
40-99 hp	2,501	2,360	+ 6.0	29,426	29,392	+ .1
100-139 hp	369	674	-45.3	5,952	7,080	-15.9
Over 140 hp	877	1,459	-39.9	7,989	10,415	-23.3
Total 2-wheel drive	8,140	7,992	+ 1.9	89,544	87,050	+ 2.9
4-wheel drive						
Under 200 hp	66	74	-10.8	636	1,165	-45.4
Over 200 hp	115	177	-35.0	1,270	1,926	-34.1
Total 4-wheel drive	181	251	-27.9	1,906	3,091	-38.3
Total All Tractors	8,321	8,243	+ .9	91,450	90,141	+ 1.5
S-P Combines	1,092	1,391	-21.5	4,907	6,566	-25.3
Balers (under 200-lb. bales)	528	666	-20.7	6,273	7,369	-14.9
Forage Harvesters (shear-bar type)	430	583	-26.2	1,756	2,392	-26.6
Mower-Conditioners	905	1,049	-13.7	9,810	11,514	-14.8

Canadian Retail Volume Improved in Some Product Areas

Through the first nine months of 1985, Canadian retail sales of farm equipment have shown moderate improvement over 1984, according to the flash report of the Canadian Farm & Industrial Equipment Institute.

Total tractor volume is up 6 per cent to 14,182 units; self-propelled combines are exactly even with the 1984 pace at

1,643 units; large balers are up 18 per cent at 1,984 machines; pull-type combines are up 5 per cent at 712; self-propelled swathers are up 6 per cent at 1,705.

Within the tractor group, only four-wheel-drive sales are below the 1984 level—down 9 per cent to 1,624 units. Sales of tractors under 40 hp are up 13 per cent at 3,132; the 40-99-hp

group is up 4 per cent at 6,004; two-wheelers over 100 hp are up 13 per cent at 3,422.

Downside items on the CFIEI flash report for the year to date: balers (under 200 lbs.), down 14 per cent at 1,411; mower-conditioners, down 3 per cent at 1,909; forage harvesters, down 18 per cent at 356; pull-type swathers, down 4 per cent at 1,853.

I&T's 48TH MARKET STATISTICS ISSUE

■ **INTEREST** in the international aspects of the farm and industrial equipment business has never been stronger. Thus, we're particularly proud of having presented an up-to-date assembly of export and import numbers over recent years for the industry.

Over the past decade, the U.S. farm equipment industry has posted a total favorable balance of trade of \$6.77 billion. The balance peaked in 1981 at \$1.4 billion at a time when exports were moving up in value and imports were declining.

That trend subsequently has reversed itself. The balance in 1984 was \$506 million; when 1985 information is available, the balance will likely be in the \$300 million range, which was the level in 1979.

The U.S. has had two major farm equipment export strengths—big tractors headed for markets such as Canada and Australia, and parts for tractors and other equipment going to the European subsidiary factories of North American companies. In recent years, as world grain surpluses have affected farm prices, demand for big tractors in grain producing areas has gone down. Meanwhile, European customers for U.S. tractor and farm equipment parts have been sourcing more of their components elsewhere.

Meanwhile, value of tractors, tractor parts, and other farm equipment and parts imports have increased. The rise has been moderate, however, as the strength of the U.S. dollar has made it easier to

pay for such imports and as domestic demand for farm equipment in general has been soft.

A brief summary of exports and imports in millions of dollars:

Year	Exports	Imports	Balance
1980	2,531	1,773	858
1981	2,942	1,550	1,392
1982	2,378	1,180	1,199
1983	2,014	1,347	667
1984	2,235	1,729	506
1985*	982	830	152

*Through June 30

Industry shipments data, for many years a feature of I&T's Market Statistics Issue, has tended to arrive in some recent years too late for inclusion, and such is the case this year with regard to the 1984 numbers. Last year, the information arrived too late for inclusion in the November MSI but was received in time for December. We hope we'll be able to get the data in the December issue this year, but can make no promises as we go to press.

Principal machines on farms, which includes census totals by state and I&T estimates as of July 1, 1985, reflects the very gradual decline in equipment populations. For instance, the tractor population in the North Central states, which the Census of Agriculture of 1978 indicated was 2.42 million, is now estimated at 2.254 million, a decline of less than 7 per cent.

Total tractors on U.S. farms was 4.623 million in 1978; today, the total is 4.476 million, a decline of only 4 per cent.



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Motor Vehicles and Specified Machines on U.S. Farms and Average Prices of Wheel Tractors, January 1, Designated Years¹

Year	Tractors (exclusive of steam & garden) ² Thousands	Motor Trucks Thousands	Grain Combines Thousands	Corn Pickers and Picker Shellers Thousands	Pick-up Balers Thousands	Field Forage Harvesters Thousands	Garden Tractors and Motor Tillers ³ Thousands	Wheel Tractors Wholesale Prices ⁴ Per Unit Dollars	Horsepower Dollars
1963.....	4,778	2,925	940	720	718	307	500	\$ 3,046	\$ 53
1964.....	4,786	2,970	920	705	734	312	513	\$ 3,443	\$ 53
1965.....	4,787	3,030	910	690	751	316	699	\$ 3,541	\$ 56
1966.....	4,783	3,017	888	686	752	316	725	\$ 3,886	\$ 58
1967.....	4,786	3,009	867	680	748	319	750	\$ 4,257	\$ 62
1968.....	4,766	3,016	847	673	739	321	770	\$ 4,709	\$ 66
1969.....	4,712	3,004	820	657	725	314	790	\$ 4,976	\$ 71
1970.....	4,619	2,978	790	635	708	304	805	\$ 5,560	\$ 76
1971.....	4,562	2,985	760	629	698	309	815	\$ 6,190	\$ 80
1972.....	4,509	2,993	725	625	687	315	825	\$ 6,486	\$ 84
1973.....	4,477	3,006	703	618	680	324	835	\$ 6,953	\$ 85
1974.....	4,478	3,020	685	618	677	332	850	\$ 7,294	\$ 86
1975.....	4,463	3,032	666	615	666	337	870	\$ 8,459	\$ 91
1976.....	4,434	3,043	647	610	642	342	890	\$11,220	\$112
1977.....	4,381	3,052	630	605	614	346	905	\$12,692	\$124
1978.....	4,350	3,054	615	600	595	345	917	\$13,431	\$144
1979.....	4,623	3,350	655	596	744	295	927	\$16,512	\$149
1980.....	4,598	3,367	653	592	759	293	933	\$18,139	\$166
1981.....	4,573	3,385	650	587	774	291	938	\$23,308	\$199
1982.....	4,547	3,405	647	582	788	288	942	\$25,941	\$204
1983.....	4,520	3,427	644	576	799	285	944	\$33,647	\$234
1984.....	4,497	3,449	642	569	810	282	945	\$35,590	\$245
1985.....	4,480	3,467	640	561	822	280	942	\$39,514	\$288

¹SOURCE: Reports of the USDA and the Bureau of the Census. On-farm data after 1970, except 1975 and 1979, are estimated by I&T.

²Consists of Wheel and Crawler Tractors.

³Motor Tillers included after 1964.

⁴Estimated at wholesale level by dividing Value of Manufacturers' Shipments by Units Shipped and by Maximum Belt Horsepower, data are published in "Current Industrial Reports" of the Bureau of the Census.

Note: Data from the 1978 Census (Jan. 1, 1979 above) and later years, reflect changes in sample coverage and are not fully comparable with earlier years.

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Principal Machines on Farms — 1985

STATE	WHEEL TRACTORS			SELF-PROPELLED COMBINES			CORN HEADS		
	1978 Census Number	1982 Census Number	Estimated July 1, 1985 Number	1978 Census Number	1982 Census Number	Estimated July 1, 1985 Number	1978 Census Number	1982 Census Number	Estimated July 1, 1985 Number
Maine	13,741	13,569	13,470	388	320	280	183	181	180
New Hampshire	4,877	5,097	5,220	14	8	6	64	50	45
Vermont	14,637	15,274	15,570	156	76	65	346	374	390
Massachusetts	9,840	9,956	10,000	26	23	21	113	145	160
Rhode Island	1,462	1,364	1,300	13	6	5	17	13	12
Connecticut	7,865	8,421	8,700	86	53	43	157	98	83
New York	120,215	119,498	119,100	5,775	6,030	6,150	3,401	3,904	4,150
New Jersey	20,655	20,554	20,500	1,086	1,011	960	532	593	620
Pennsylvania	137,998	136,505	135,700	9,674	9,707	9,720	4,409	5,408	5,900
Delaware	8,348	8,012	7,860	1,314	1,342	1,360	1,003	1,006	1,010
Maryland	36,251	36,951	37,300	3,518	3,279	3,150	2,732	2,840	2,900
NORTHEAST	375,889	375,201	374,720	22,050	21,855	21,760	12,957	14,612	15,450
Ohio	198,865	193,367	190,400	33,449	33,200	33,000	24,438	26,403	27,400
Indiana	176,767	167,563	162,600	37,402	34,646	33,200	32,638	31,391	30,900
Illinois	277,604	262,112	257,000	63,230	61,411	60,500	55,793	55,636	55,500
Iowa	323,132	305,334	297,000	55,586	57,726	59,200	53,030	57,046	59,000
Missouri	198,225	193,758	191,800	33,378	32,957	32,700	23,056	21,834	21,200
CORN BELT	1,174,593	1,122,134	1,098,800	223,045	219,940	218,600	188,955	192,310	194,000
Michigan	148,063	146,655	146,100	18,919	21,060	21,800	11,076	13,583	15,000
Wisconsin	252,594	243,827	239,700	18,262	19,215	19,700	8,458	11,939	13,900
Minnesota	277,920	264,581	258,400	44,841	45,847	46,300	27,197	31,098	33,200
LAKE STATES	678,577	655,063	644,200	82,022	86,122	87,800	46,731	56,620	62,100
North Dakota	120,191	108,103	102,800	30,782	27,546	26,500	1,619	2,708	3,200
South Dakota	111,485	105,699	101,400	16,503	16,961	17,200	7,759	9,606	10,800
Nebraska	175,569	164,308	160,200	35,083	34,032	33,500	24,623	25,484	26,400
Kansas	157,327	149,870	146,300	47,142	46,662	46,400	9,150	8,321	7,600
GREAT PLAINS	564,572	527,980	510,700	129,510	125,201	123,600	43,151	46,119	48,000
West Virginia	24,901	27,110	28,200	479	562	640	265	471	520
Kentucky	157,432	163,176	165,400	10,568	11,466	12,000	8,382	9,924	10,730
Tennessee	120,161	126,365	130,500	10,765	11,227	11,500	5,581	6,508	7,000
Virginia	83,836	88,511	90,300	5,878	6,224	6,400	4,255	5,061	5,400
North Carolina	145,863	131,488	127,300	13,297	13,820	12,500	10,326	10,618	10,740
APPALACHIAN	532,193	536,650	541,700	40,987	42,299	43,040	28,809	32,582	34,396
South Carolina	47,967	44,338	42,200	6,420	6,263	6,150	3,854	3,808	3,800
Georgia	79,031	75,505	73,500	9,589	8,980	8,700	7,302	6,438	6,000
Florida	51,099	52,346	52,900	1,726	1,742	1,750	1,112	1,307	1,400
Alabama	69,438	66,330	64,800	6,660	6,935	7,100	3,383	3,630	3,750
SOUTHEAST	247,535	238,519	233,400	24,395	23,920	23,700	15,651	15,183	14,950
Mississippi	72,483	70,139	69,200	9,911	9,695	9,600	527	861	1,020
Louisiana	58,373	56,883	56,200	9,624	8,468	7,850	377	286	250
Arkansas	84,108	81,556	80,400	13,960	12,891	12,300	292	221	200
DELTA STATES	214,964	208,578	205,800	33,495	31,054	29,750	1,196	1,368	1,470
Oklahoma	99,771	99,934	100,000	17,647	17,299	17,100	822	600	500
Texas	262,886	264,740	265,600	23,026	21,049	19,900	3,628	3,913	4,050
SOUTHERN PLAINS	362,657	364,674	365,600	40,673	38,348	37,000	4,450	4,513	4,550
Montana	54,737	54,666	54,600	13,180	12,038	11,300	101	89	85
Idaho	53,552	50,575	49,200	9,843	9,309	9,000	414	344	330
Wyoming	19,322	20,673	21,300	1,999	1,991	1,990	171	221	250
Colorado	58,331	56,141	55,300	8,404	7,994	7,800	2,397	2,618	2,700
New Mexico	16,601	17,455	17,800	1,513	1,346	1,240	246	308	340
Arizona	11,956	12,262	12,410	509	369	300	60	94	110
Utah	21,145	21,613	21,800	1,743	1,591	1,490	186	225	250
Nevada	5,142	5,160	5,170	263	234	210	3	19	25
MOUNTAIN STATES	240,786	238,545	237,580	37,454	34,872	33,330	3,578	3,918	4,090
Washington	53,301	59,377	62,200	8,431	8,314	8,250	470	558	600
Oregon	48,158	53,243	55,800	6,335	6,235	6,170	-	209	220
California	129,480	139,735	145,500	6,270	6,102	6,000	1,016	1,123	1,180
PACIFIC	230,939	252,355	263,500	21,036	20,651	20,420	1,486	1,890	2,000
TOTAL	4,622,705	4,519,699	4,476,000	654,667	644,262	639,000	346,964	369,115	381,000

•Not reported separately.

Principal Machines on Farms — 1985

STATE	PICK-UP BALERS			FIELD FORAGE HARVESTERS ¹			MOWER CONDITIONERS ²		
	1978 Census Number	1982 Census Number	Estimated July 1, 1985 Number	1978 Census Number	1982 Census Number	Estimated July 1, 1985 Number	1978 Census Number	1982 Census Number	Estimated July 1, 1985 Number
Maine	2,609	3,047	3,250	1,309	1,181	1,120	2,023	2,353	2,550
New Hampshire	1,254	1,259	1,260	545	544	540	889	960	1,010
Vermont	4,082	4,167	4,200	2,707	2,569	2,470	3,777	3,866	3,920
Massachusetts	1,732	1,704	1,680	1,092	1,083	1,080	1,472	1,533	1,570
Rhode Island	181	205	215	113	93	90	124	146	160
Connecticut	1,509	1,508	1,500	804	773	760	1,063	1,318	1,470
New York	28,853	28,078	27,600	20,298	19,040	18,400	25,390	25,603	25,720
New Jersey	2,194	2,260	2,300	1,093	1,165	1,200	2,275	2,386	2,450
Pennsylvania	37,288	37,257	37,200	18,891	18,078	17,500	29,419	29,456	29,480
Delaware	568	531	515	269	249	240	587	519	480
Maryland	5,581	5,719	5,800	2,852	2,670	2,600	4,653	5,136	5,390
NORTHEAST	85,851	85,735	85,520	49,973	47,465	46,000	71,672	73,276	74,200
Ohio	38,496	39,754	40,300	11,209	11,090	11,050	26,997	26,143	25,750
Indiana	23,838	23,947	24,000	6,912	6,917	6,920	15,733	15,583	15,480
Illinois	30,632	30,463	30,300	11,557	9,972	9,200	21,173	21,867	22,250
Iowa	47,389	47,776	48,000	19,393	17,638	16,800	26,375	28,401	29,500
Missouri	43,981	48,662	50,500	8,704	8,055	7,700	23,469	26,527	28,140
CORN BELT	184,336	190,602	193,100	57,775	53,672	51,670	113,747	118,521	121,120
Michigan	24,536	25,051	25,300	12,704	11,809	11,300	20,696	21,055	21,300
Wisconsin	58,443	58,042	57,800	43,154	43,880	44,300	51,830	51,630	51,500
Minnesota	50,165	51,038	51,500	23,341	23,803	24,000	31,714	32,050	32,200
LAKE STATES	133,144	134,131	134,600	79,198	79,492	79,600	104,240	104,735	105,000
North Dakota	15,180	16,628	17,300	5,538	4,839	4,600	6,315	6,181	6,100
South Dakota	14,174	17,966	19,800	11,280	10,568	10,200	5,673	6,958	17,050
Nebraska	16,968	18,906	20,000	13,870	12,538	11,900	14,740	15,497	16,000
Kansas	29,222	31,998	33,500	10,778	9,367	8,650	17,144	18,932	19,800
GREAT PLAINS	75,544	85,498	90,600	41,466	37,312	35,350	43,872	47,568	58,950
West Virginia	9,119	10,550	11,300	2,094	2,323	2,420	5,035	6,033	6,550
Kentucky	31,575	35,143	37,100	7,752	7,910	8,010	23,656	23,805	23,900
Tennessee	22,028	26,506	28,800	5,202	6,313	6,900	16,834	18,734	25,300
Virginia	17,932	21,805	23,600	6,075	6,209	6,280	12,404	14,659	16,100
North Carolina	12,461	12,752	12,900	4,204	3,502	3,100	10,577	10,888	11,100
APPALACHIAN	93,115	106,756	113,700	25,327	26,257	26,710	68,506	74,119	82,950
South Carolina	4,404	4,823	5,030	1,369	1,260	1,200	3,370	4,033	4,400
Georgia	8,671	10,407	11,230	2,652	2,717	2,750	9,176	9,465	9,600
Florida	2,787	3,754	4,250	903	861	850	6,406	7,591	8,300
Alabama	10,068	11,322	12,000	2,102	2,112	2,120	8,349	8,212	8,150
SOUTHEAST	25,930	30,306	32,510	7,026	6,950	6,920	27,301	29,301	30,450
Mississippi	8,286	10,509	11,600	2,003	1,927	1,900	7,294	7,949	8,300
Louisiana	5,666	6,425	6,800	1,299	1,327	1,340	6,587	6,698	6,770
Arkansas	10,783	13,994	15,700	1,882	1,634	1,500	8,366	10,035	10,950
DELTA STATES	24,735	30,928	34,100	5,184	4,888	4,740	22,247	24,682	26,020
Oklahoma	19,242	22,690	24,400	2,420	2,491	2,540	14,990	17,107	18,300
Texas	26,382	33,736	36,500	5,339	5,109	4,980	32,449	39,629	30,200
SOUTHERN PLAINS	45,624	56,426	60,900	7,759	7,600	7,520	47,439	56,736	48,500
Montana	11,692	12,468	12,900	2,086	2,429	2,600	7,304	8,102	8,500
Idaho	12,862	12,210	11,900	2,391	2,384	2,380	9,029	8,515	8,250
Wyoming	4,468	5,066	5,400	1,261	1,222	1,200	3,433	3,904	4,160
Colorado	10,374	10,365	10,350	4,355	3,503	3,100	7,259	7,040	6,950
New Mexico	3,252	3,403	3,490	774	802	820	2,317	2,395	2,450
Arizona	1,004	1,042	1,050	298	348	370	780	861	910
Utah	6,922	6,965	6,980	1,874	1,978	2,040	5,098	5,547	5,800
Nevada	1,470	1,598	1,650	353	437	480	1,245	1,314	1,360
MOUNTAIN STATES	52,044	53,117	53,720	13,392	13,103	12,990	36,465	37,678	38,380
Washington	8,717	9,518	9,900	2,890	3,060	3,150	8,107	9,838	10,800
Oregon	8,443	9,730	10,400	2,602	2,555	2,530	7,033	8,528	9,330
California	6,358	6,725	6,950	2,530	2,715	2,820	7,558	9,299	10,300
PACIFIC	23,518	25,973	27,250	8,022	8,330	8,500	22,698	27,665	30,430
TOTAL	743,841	799,472	826,000	295,123	285,069	280,000	558,187	594,281	616,000

¹Shear-bar type. ²Does not include windrowers with conditioning rolls.

Principal Machines on Farms — 1985

STATE	POWER ELEVATORS Estimated July 1, 1985 Number	MANURE SPREADERS Estimated July 1, 1985 Number	CORN & COTTON PLANTERS Estimated July 1, 1985 Number	GRAIN DRILLS Estimated July 1, 1985 Number	MOLDBOARD PLOWS Estimated July 1, 1985 Number	SIDE DELIVERY RAKES Estimated July 1, 1985 Number	POWER TRACTOR MOWERS* Estimated July 1, 1985 Number
Maine	4,800	2,880	300	800	7,950	5,460	6,250
New Hampshire	2,270	1,840	270	60	2,720	2,320	2,850
Vermont	7,290	5,790	1,500	300	9,190	6,900	8,500
Massachusetts	3,270	2,100	820	110	5,500	3,280	3,760
Rhode Island	460	250	100	30	640	300	310
Connecticut	3,810	2,250	960	80	5,220	2,320	3,300
New York	63,500	37,000	18,450	25,150	72,600	44,600	52,300
New Jersey	5,580	2,220	2,250	2,300	15,170	3,740	4,320
Pennsylvania	67,600	38,300	31,520	37,600	92,300	46,000	58,000
Delaware	3,590	1,620	1,980	1,900	5,820	980	1,000
Maryland	14,900	7,730	8,080	8,400	26,140	8,400	10,800
NORTHEAST	177,070	101,980	66,230	76,730	243,250	124,300	151,390
Ohio	116,100	51,800	59,800	60,000	148,500	52,500	61,200
Indiana	115,200	45,800	61,400	48,700	126,800	38,700	48,000
Illinois	175,800	67,000	89,800	61,500	164,500	50,300	67,500
Iowa	184,700	91,300	99,800	57,300	196,000	85,000	101,500
Missouri	82,100	51,400	47,700	49,500	138,100	50,000	82,200
CORN BELT	673,900	307,300	358,500	277,000	773,900	276,500	360,400
Michigan	82,300	33,800	36,300	48,300	119,800	41,100	45,500
Wisconsin	129,800	77,600	64,000	61,500	153,400	86,000	98,200
Minnesota	145,400	70,200	77,000	71,200	165,400	83,000	91,500
LAKE STATES	357,500	181,600	177,300	181,000	438,600	210,100	235,200
North Dakota	70,500	19,100	14,400	56,400	60,700	21,700	38,700
South Dakota	62,600	26,700	28,900	31,900	60,800	22,100	45,200
Nebraska	97,000	40,900	43,200	41,000	86,500	33,600	52,300
Kansas	103,500	34,100	21,200	66,600	87,800	34,500	51,800
GREAT PLAINS	333,600	120,800	107,700	195,900	295,800	111,900	188,000
West Virginia	6,250	7,730	5,000	3,490	18,100	9,150	17,800
Kentucky	24,100	25,500	36,800	10,780	102,800	29,800	48,000
Tennessee	14,850	18,600	49,700	13,450	66,600	23,800	51,400
Virginia	18,350	19,900	25,000	16,350	62,300	22,800	31,600
North Carolina	20,100	19,500	70,100	22,000	59,800	15,500	32,100
APPALACHIAN	83,650	91,230	186,600	66,070	309,600	101,050	180,900
South Carolina	4,570	3,600	29,500	11,340	10,550	5,830	9,850
Georgia	13,640	6,100	37,300	9,700	29,400	10,400	16,580
Florida	3,620	1,100	5,710	1,680	19,050	1,880	3,730
Alabama	11,200	4,070	40,600	6,820	22,050	7,380	16,200
SOUTHEAST	33,030	14,870	113,110	29,540	81,050	25,490	46,360
Mississippi	7,660	4,650	50,500	8,030	27,700	9,480	21,200
Louisiana	2,500	2,680	17,100	7,170	20,800	6,120	10,700
Arkansas	9,350	6,530	20,800	12,800	45,800	10,200	20,500
DELTA STATES	19,510	13,860	88,400	28,000	94,300	25,800	52,400
Oklahoma	24,950	8,480	8,880	31,300	77,000	19,400	32,000
Texas	39,700	16,100	53,400	48,800	87,700	22,500	46,500
SOUTHERN PLAINS	64,650	24,580	62,280	80,100	164,700	41,900	78,500
Montana	27,750	10,000	1,050	21,100	27,300	13,650	21,200
Idaho	24,230	12,470	2,560	15,380	33,100	16,000	21,100
Wyoming	4,980	4,280	920	4,100	15,550	5,150	6,060
Colorado	24,970	12,730	6,000	15,300	26,000	14,000	15,500
New Mexico	2,550	2,080	3,050	1,940	8,720	4,150	4,650
Arizona	1,790	880	1,850	1,410	3,350	1,400	2,000
Utah	9,970	6,900	1,630	5,450	15,050	9,230	10,700
Nevada	930	1,020	60	320	2,530	1,480	1,540
MOUNTAIN STATES	97,170	50,360	17,120	65,000	131,600	65,060	82,750
Washington	21,550	13,150	1,770	17,130	36,700	13,400	20,500
Oregon	17,370	11,610	1,110	11,670	35,700	11,800	19,300
California	24,000	13,660	8,880	8,860	59,800	13,700	23,300
PACIFIC	62,920	38,420	11,760	37,660	132,200	38,900	63,100
TOTAL	1,903,000	945,000	1,189,000	1,037,000	2,665,000	1,021,000	1,439,000

*Cutter bar type only.

Principal Machines on Farms — 1985

STATE	MOTOR TRUCKS			INTERNAL COMBUSTION ENGINES ¹	CHAIN SAWS
	1978 Census 1,000's	1982 Census 1,000's	Estimated July 1, 1985 1,000's	Estimated July 1, 1985 Number	Estimated July 1, 1985 Number
Maine	12.3	12.2	12.2	1,490	7,350
New Hampshire	3.8	4.1	4.3	1,400	2,440
Vermont	6.6	7.5	8.0	1,950	6,100
Massachusetts	9.0	9.4	9.6	2,010	4,450
Rhode Island	1.3	1.3	1.3	210	620
Connecticut	6.6	6.8	6.9	1,770	3,740
New York	57.6	60.5	62.2	23,200	49,100
New Jersey	14.4	15.2	15.7	2,590	5,870
Pennsylvania	63.8	66.1	67.3	22,800	43,000
Delaware	6.2	6.2	6.2	1,040	2,490
Maryland	22.8	25.9	27.6	5,100	12,050
NORTHEAST	204.4	215.2	221.3	63,560	137,210
Ohio	107.1	107.8	108.3	21,700	59,900
Indiana	114.4	112.2	112.3	22,300	64,200
Illinois	150.6	150.6	150.6	33,200	69,700
Iowa	144.0	147.7	149.6	35,200	55,400
Missouri	155.9	159.7	162.1	36,000	92,700
CORN BELT	672.0	678.0	682.9	148,400	341,900
Michigan	77.4	80.3	82.1	19,900	44,770
Wisconsin	98.0	99.5	100.2	38,300	90,900
Minnesota	144.1	143.8	143.5	51,600	65,000
LAKE STATES	319.5	323.6	325.8	109,800	200,670
North Dakota	107.7	101.1	97.2	39,000	4,200
South Dakota	66.0	68.0	69.0	25,900	3,230
Nebraska	118.6	118.9	119.1	35,200	13,820
Kansas	160.8	159.4	158.3	45,800	22,800
GREAT PLAINS	453.1	447.4	443.6	145,900	44,050
West Virginia	19.2	20.5	21.2	5,400	21,250
Kentucky	119.3	125.2	129.0	17,700	43,900
Tennessee	96.4	104.7	109.9	13,500	57,900
Virginia	62.6	68.0	70.8	13,100	47,900
North Carolina	106.2	103.3	101.3	17,000	85,800
APPALACHIAN	403.7	421.7	432.2	66,700	256,750
South Carolina	36.1	34.6	33.7	6,760	24,240
Georgia	74.3	72.6	71.7	13,950	33,400
Florida	49.4	51.2	52.2	13,500	7,630
Alabama	68.6	67.4	66.7	11,410	31,460
SOUTHEAST	228.4	225.8	224.3	45,620	96,730
Mississippi	58.0	59.0	59.6	10,970	37,150
Louisiana	44.9	44.3	44.1	13,080	20,370
Arkansas	80.7	79.3	78.5	14,830	31,200
DELTA STATES	183.6	182.6	182.2	38,880	88,720
Oklahoma	118.3	122.8	126.5	22,400	10,100
Texas	239.0	249.9	266.7	66,500	19,700
SOUTHERN PLAINS	357.3	372.7	393.2	88,900	29,800
Montana	67.2	68.2	68.8	20,200	12,020
Idaho	56.7	57.1	57.2	16,600	13,320
Wyoming	20.0	22.1	23.4	6,600	3,240
Colorado	63.4	63.0	62.8	21,310	6,140
New Mexico	23.9	24.6	25.1	7,950	3,060
Arizona	15.3	16.6	17.4	5,380	520
Utah	21.7	23.3	24.3	6,900	2,420
Nevada	6.0	6.5	6.8	1,600	610
MOUNTAIN STATES	274.2	281.4	285.8	86,540	41,330
Washington	64.7	69.2	71.2	17,300	23,140
Oregon	54.4	61.2	59.3	22,400	26,200
California	134.6	147.9	155.2	67,000	32,500
PACIFIC	253.7	278.3	285.7	106,700	81,840
TOTAL	3,349.9	3,426.7	3,477.0	901,000	1,319,000

¹Includes engines used for stationary work such as irrigation, auxiliary engines on combines, balers, etc., and a small number of power units not elsewhere classified.

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EQUIPMENT ON CANADIAN FARMS, 1981

Item	All Canada	Four Maritime Provinces**	Quebec	Ontario	Manitoba	Sas- katchewan	Alberta	British Columbia
Total number of farms	318,361	12,941	48,144	82,448	29,442	67,318	58,056	20,012
Tractors, total	657,606	21,077	92,809	178,041	67,342	145,362	124,214	28,761
20-49 pto hp	263,308	11,266	49,633	89,290	24,215	37,555	36,116	15,962
50-99 pto hp	268,117	8,334	38,288	71,440	27,588	60,424	51,933	10,110
100-149 pto hp	90,725	1,250	4,605	13,776	11,066	33,555	24,492	1,981
150 pto hp and over	35,726	227	1,283	3,535	4,472	13,828	11,673	708
Combines, self-propelled	114,530	1,379	5,386	17,615	16,309	39,001	33,430	1,410
Combines, pull-type	46,580	853	1,490	7,519	6,322	20,703	9,233	460
Swathers, self-propelled	94,292	313	4,388	8,377	13,774	32,893	32,600	1,947
Swathers, pull-type	70,316	679	3,129	4,513	10,517	34,695	001	1,782
Balers (bales under 200 lbs)	144,661	6,706	26,964	38,048	11,927	26,860	27,951	6,205
Balers (bales over 200 lbs)	20,680	277	545	1,482	3,767	5,709	7,919	985
Forage harvesters	35,756	1,241	7,632	16,351	1,383	2,498	4,440	2,211
Total value,* other machinery and equipment	\$4.657 bil.	\$145 mil.	\$645 mil.	\$1.09 bil.	\$430 mil.	\$1.099 bil.	\$1.040 bil.	\$206 mil.
Total value,* all machinery and equipment	\$17.444 bil.	\$453 mil.	\$1.732 bil.	\$3.462 bil.	\$1.823 bil.	\$4.917 bil.	\$4.362 bil.	\$693 mil.

*Value in Canadian dollars.

**Newfoundland, Prince Edward Island, New Brunswick, Nova Scotia.

Source: Statistics Canada.

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RETAIL SALES OF SELECTED FARM EQUIPMENT — Jan.-Dec., 1983 and 1984(1) (In Units)

State	Combines		Corn Heads		Hay Bales(2)		Windrowers Self-Propelled		Total Heads		Grinder- Mixers		Shear-Bar Forage Harvesters(3)		Mower Conditioners All Types	
	Self-Propelled		1983 1984		1983 1984		Power Units		1983 1984		1983 1984		1983 1984		1983 1984	
	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984
Alabama	110	89	16	23	112	101	.....	.....	.....	.....	67	41	12	12	84	91
Alaska	.....	.....	.....	.....	4	3	.....	.....	.....	.....	.....	.....	2	1	5	3
Arizona	9	45	1	1	17	33	34	46	39	56	1	1	4	9	6	4
Arkansas	365	424	3	8	131	165	.....	.....	.....	.....	49	31	10	11	234	250
California	91	78	33	38	110	131	150	159	172	180	2	1	56	37	35	22
Colorado	147	121	43	47	290	258	136	112	149	123	18	12	39	23	114	85
Connecticut	.....	.....	.....	.....	45	37	.....	.....	.....	.....	2	1	27	31	62	60
Delaware	24	33	14	22	8	13	1	.....	1	.....	3	3	2	7	11	11
Florida	29	20	5	5	56	72	.....	.....	.....	-2	8	3	13	16	57	38
Georgia	197	238	82	111	128	133	8	1	8	1	66	44	25	31	134	150
Hawaii	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Idaho	231	183	6	3	288	220	160	136	184	148	18	13	40	27	102	55
Illinois	1,417	1,424	1,342	1,297	217	236	11	4	12	6	281	140	116	103	455	417
Indiana	778	763	719	695	212	192	3	4	5	4	215	119	84	86	409	403
Iowa	1,411	982	1,323	1,115	193	171	39	22	46	23	703	288	187	105	565	517
Kansas	852	697	82	88	199	171	154	115	156	123	88	49	69	43	420	323
Kentucky	128	171	87	95	182	205	6	2	5	2	127	80	69	77	717	593
Louisiana	144	156	2	4	68	76	.....	.....	1	.....	11	6	2	2	21	28
Maine	3	1	.....	.....	48	53	1	2	1	2	1	.....	22	20	70	86
Maryland	71	96	61	82	88	75	5	5	5	6	21	19	26	36	129	104
Massachusetts	.....	.....	1	.....	48	37	.....	.....	.....	.....	.....	.....	32	24	57	58
Michigan	260	212	234	213	236	248	23	25	26	28	140	110	181	198	428	465
Minnesota	1,008	755	659	489	574	413	245	162	257	178	319	155	386	300	865	653
Mississippi	215	206	6	5	57	66	3	1	3	1	33	18	23	24	41	50
Missouri	435	444	128	141	278	296	14	22	15	16	188	118	91	44	799	879
Montana	350	191	.....	.....	123	105	179	105	213	121	38	32	17	30	111	102
Nebraska	771	531	540	405	123	71	131	109	152	130	213	84	141	84	375	235
Nevada	1	1	.....	.....	23	28	33	26	38	30	3	2	6	2	7	8
New Hampshire	.....	.....	.....	.....	45	42	.....	.....	-1	.....	.....	.....	25	20	41	57
New Jersey	8	11	2	4	39	29	.....	1	.....	1	5	9	7	6	50	50
New Mexico	3	11	.....	1	101	151	46	38	50	40	5	2	9	3	24	24
New York	49	49	58	55	460	432	38	25	40	25	67	31	419	390	787	741
North Carolina	222	247	194	218	202	221	1	1	1	1	72	43	47	50	339	351
North Dakota	682	652	49	44	34	18	319	252	368	283	82	59	67	49	161	112
Ohio	481	466	356	391	359	340	9	11	10	11	167	145	130	131	618	613
Oklahoma	257	269	6	2	263	275	74	53	83	56	61	29	16	9	520	350
Oregon	130	77	2	8	215	167	93	65	114	74	17	2	21	28	135	78
Pennsylvania	94	112	97	107	595	539	25	31	28	31	156	132	272	266	817	842
Rhode Island	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	1	.....	2	3
South Carolina	95	98	43	42	46	64	.....	.....	.....	.....	23	17	9	17	87	102
South Dakota	385	294	160	117	75	56	232	201	244	225	173	92	136	123	123	113
Tennessee	175	219	40	38	249	237	1	2	1	2	125	88	54	48	603	558
Texas	448	497	83	123	611	519	50	45	64	46	132	105	27	24	1,012	844
Utah	26	24	4	2	247	206	71	57	73	63	14	7	39	38	147	154
Vermont	1	.....	.....	2	74	55	.....	4	.....	4	.....	1	87	61	172	165
Virginia	84	92	60	68	195	167	2	2	2	2	63	47	82	105	506	545
Washington	238	157	19	16	248	210	72	53	79	64	9	1	52	28	115	110
West Virginia	3	2	5	3	79	84	.....	.....	.....	.....	9	15	24	12	128	121
Wisconsin	204	259	252	283	911	787	135	133	144	132	204	150	870	737	1,485	1,400
Wyoming	46	25	13	8	131	102	89	59	99	71	19	4	15	10	56	34
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous(4)	73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL	12,751	11,422	6,830	6,419	9,037	8,314	2,593	2,091	2,887	2,307	4,018	2,349	4,391	3,538	14,261	13,057

Data released Feb. 12, 1985, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.

(2) For making bales of under 200 lbs.

(3) Pull-type, mounted, self-propelled.

(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

FARM WHEEL TRACTOR

RETAIL SALES BY STATE, 1981-1984

State	1981			1982			1983			1984		
	2-wheel Drive 40 PTO HP & over	4-wheel Drive	Total Tractors	2-wheel Drive 40 PTO HP & over	4-wheel Drive	Total Tractors	2-wheel Drive	4-wheel Drive	Total Tractors	2-wheel Drive	4-wheel Drive	Total Tractors
Alabama	1,738	28	1,766	1,108	14	1,122	2,325	3	2,328	2,653	10	2,663
Alaska	56	1	57	10	.....	10	78	.....	78	71	.....	71
Arizona	814	85	899	425	73	498	619	27	646	782	30	812
Arkansas	2,686	328	3,014	1,772	125	1,897	3,582	139	3,721	3,714	91	3,805
California	3,948	453	4,401	2,976	251	3,227	5,040	214	5,254	5,946	186	6,132
Colorado	982	218	1,200	634	121	755	1,188	126	1,314	1,234	106	1,340
Connecticut	175	2	177	145	2	147	491	- 2	489	618	3	621
Delaware	108	3	111	79	5	84	258	4	262	248	7	255
Florida	2,314	70	2,384	1,636	55	1,691	3,622	68	3,690	4,614	19	4,633
Georgia	2,404	28	2,432	1,821	27	1,848	3,660	6	3,666	4,655	10	4,665
Hawaii	59	7	66	37	2	39	141	.....	141	116	5	121
Idaho	1,287	264	1,551	812	197	1,009	1,013	131	1,144	1,062	117	1,179
Illinois	4,529	871	5,400	3,580	600	4,180	4,658	433	5,091	3,958	312	4,270
Indiana	2,399	396	2,795	1,807	289	2,096	2,837	197	3,034	2,801	135	2,936
Iowa	5,437	654	6,091	4,319	475	4,794	4,149	284	4,433	2,964	129	3,093
Kansas	2,646	505	3,151	2,353	515	2,868	2,575	403	2,978	2,199	342	2,541
Kentucky	3,107	43	3,150	2,609	23	2,632	3,244	21	3,265	2,945	15	2,960
Louisiana	2,525	204	2,729	1,607	66	1,673	4,143	64	4,207	3,894	48	3,942
Maine	252	7	259	242	3	245	549	1	550	615	.....	615
Maryland	563	18	581	492	14	506	1,440	17	1,457	1,683	7	1,690
Massachusetts	153	.....	153	144	1	145	517	.....	517	621	.....	621
Michigan	2,353	376	2,729	1,613	197	1,810	2,569	143	2,712	2,751	132	2,883
Minnesota	4,130	645	4,775	2,793	479	3,272	3,029	386	3,415	2,441	295	2,736
Mississippi	2,478	171	2,649	1,563	71	1,634	2,571	31	2,602	3,030	25	3,055
Missouri	3,303	266	3,569	2,531	209	2,740	3,086	118	3,204	3,036	75	3,111
Montana	936	331	1,267	754	324	1,078	861	260	1,121	677	195	872
Nebraska	2,638	252	2,890	2,337	226	2,563	2,121	168	2,289	1,598	99	1,697
Nevada	72	12	84	66	5	71	79	4	83	82	6	88
New Hampshire	135	.....	135	158	.....	158	505	.....	505	712	1	713
New Jersey	224	.....	224	249	1	250	781	1	782	1,039	1	1,040
New Mexico	344	35	379	286	14	300	421	12	433	371	19	390
New York	2,210	173	2,383	1,741	77	1,818	2,825	54	2,879	3,296	45	3,341
North Carolina	2,778	50	2,828	2,022	34	2,056	4,072	12	4,084	4,571	12	4,583
North Dakota	1,885	887	2,772	1,322	740	2,062	1,354	491	1,845	1,112	457	1,569
Ohio	2,711	343	3,054	1,975	164	2,137	3,475	128	3,603	3,887	108	3,995
Oklahoma	2,334	295	2,629	1,891	279	2,170	2,557	218	2,775	2,364	213	2,577
Oregon	1,098	113	1,211	868	84	952	1,601	56	1,657	1,705	41	1,746
Pennsylvania	1,867	56	1,923	1,575	26	1,601	3,425	24	3,449	3,717	21	3,738
Rhode Island	14	.....	14	12	.....	12	64	.....	64	85	.....	85
South Carolina	1,049	32	1,081	779	17	796	1,524	10	1,534	1,904	2	1,906
South Dakota	1,450	292	1,742	1,355	238	1,593	1,230	221	1,451	1,060	169	1,229
Tennessee	2,653	57	2,710	1,923	29	1,952	3,803	20	3,823	3,936	15	3,951
Texas	10,409	580	10,989	6,886	299	7,185	13,786	308	14,094	12,338	226	12,564
Utah	583	24	607	466	23	489	655	21	676	688	15	703
Vermont	332	6	338	245	8	253	414	1	415	509	5	514
Virginia	1,618	19	1,637	1,455	15	1,470	2,677	6	2,683	2,736	5	2,741
Washington	1,371	191	1,562	1,168	134	1,302	1,951	125	2,076	1,956	105	2,061
West Virginia	343	.....	343	325	1	326	480	1	481	525	1	526
Wisconsin	4,035	255	4,290	2,860	167	3,027	2,907	115	3,022	2,821	82	2,903
Wyoming	335	37	372	224	44	268	277	25	302	302	26	328
U.S. Government	17	.....	17	98	.....	98	4	1	5	530	.....	530
Miscellaneous	265	.....	265	234	.....	234	605	3	608	590	3	593
TOTAL	94,152	9,683	103,835	70,381	6,763	77,144	111,838	5,099	116,937	113,759	3,975	117,734

Source: Farm & Industrial Equipment Institute. Figures do not include garden tractors, motor tillers or contractors' off-highway types. Tractors under 40 pto horsepower were not reported publicly by the FIEI prior to 1983. I&T estimates retail sales of such units were 46,742 in 1980; 47,800 in 1981; and 42,000 in 1982.

NEW AGRICULTURAL WHEEL TRACTOR IMPORTS

JAN. 1981 – JUNE 1985

Number of Units
(Excludes garden tractors except as indicated in headings, footnotes.)

Nation of Origin	Under 40 HP*	40-79 HP*	80-99 HP*	100 HP and Over*	HP Not Specifically Provided*	Not Elsewhere Specified, Excl. Industrial, Incl. Garden Types**	TOTALS
Canada							
6 mos., 1985	69	38	41	321	418	362	1,249
year 1984	56	74	145	899	1,539	985	3,698
year 1983	53	59	111	718	1,191	534	2,666
year 1982	32	63	84	347	1,383	233	2,142
year 1981	73	47	121	461	1,915	153	2,770
United Kingdom							
6 mos., 1985	2,520	6,939	504	328	75	88	10,454
year 1984	4,955	16,166	2,304	1,498	72	330	25,325
year 1983	5,173	13,502	1,840	843	32	102	21,492
year 1982	546	3,195	754	156	74	284	5,009
year 1981	614	6,031	1,109	682	15	93	8,544
Japan							
6 mos., 1985	31,308	5,399	50	39	223	112	37,131
year 1984	50,723	9,347	192	122	298	18,591	79,273
year 1983	41,265	4,490	69	136	350	9,809	56,119
year 1982	37,534	3,063	13	231	774	8,101	49,716
year 1981	40,978	2,821	3	85	714	5,469	49,530
West Germany							
6 mos., 1985	484	3,198	559	322	43	120	4,726
year 1984	124	5,333	2,113	537	18	46	8,171
year 1983	97	10,570	2,747	363	6	33	13,816
year 1982	2	4,016	2,718	668	43	32	7,479
year 1981	2	6,653	2,421	750	7	8	9,841
Italy							
6 mos., 1985	116	926	85	152	11	753	2,043
year 1984	141	1,836	432	329	1	496	3,235
year 1983	152	1,598	357	236	2	2,803	5,148
year 1982	417	1,399	369	863	2	67	3,117
year 1981	767	1,839	430	341	57	116	3,559
Romania							
6 mos., 1985	157	182	.....	.....	.....	.....	339
year 1984	225	946	.....	.....	.....	.....	1,171
year 1983	271	1,166	.....	.....	.....	17	1,454
year 1982	1,101	3,317	1	1	12	14	4,446
year 1981	558	3,050	.....	1	.....	2	3,611
France							
6 mos., 1985	55	199	100	86	1	20	461
year 1984	2	213	223	755	5	74	1,272
year 1983	133	819	234	8	.....	3	1,197
year 1982	.....	19	245	11	34	.....	309
year 1981	1	48	.....	17	.....	2	68
TOTALS							
6 mos., 1985	35,013	17,310	1,375	1,272	1,096	13,448	69,514
year 1984	56,782	35,428	5,626	4,195	2,207	20,642	124,880
year 1983	47,289	34,085	5,367	2,311	1,603	13,406	104,061
year 1982	39,764	15,858	4,190	2,378	2,366	8,739	73,295
year 1981	44,208	21,012	4,084	2,339	2,714	5,858	80,215

Others in 1984: Czechoslovakia, 758; Mexico, 606; U.S.S.R., 201.

Others in first half 1985: Czechoslovakia, 279; U.S.S.R., 133.

Source: U.S. Dept. of Commerce, International Trade Admin., Office of Capital Goods and International Construction.

*Excluding garden tractors. **Including garden tractors and rototillers.

**DOLLAR VALUE OF FARM EQUIPMENT
IMPORTS BY COUNTRY OF ORIGIN, Jan., 1980-June, 1985
(in thousands)**

Country	Jan.-Dec. 1980	Jan.-Dec. 1981	Jan.-Dec. 1982	Jan.-Dec. 1983	Jan.-Dec. 1984	Jan.-June 1985
Canada	\$820,500	\$706,276	\$487,286	\$453,551	\$576,583	\$227,137
Mexico	9,080	9,699	11,349	18,563	10,099	3,018
Brazil	1,002	1,064	4,780	6,424	11,395	7,706
Sweden	4,456	2,784	3,023	2,873	4,002	2,225
Denmark	5,703	4,690	4,910	5,856	7,670	4,687
Netherlands	15,407	13,626	13,924	32,831	46,912	18,936
United Kingdom	215,932	153,589	93,806	163,678	217,201	109,657
Belgium	67,188	50,393	25,730	23,691	27,697	16,321
France	51,488	41,695	30,804	41,333	72,605	36,053
West Germany	236,578	197,110	169,087	248,015	223,651	117,822
Hungary	10,155	9,329	7,564	2,404	11,665	2,952
Czechoslovakia	NA	NA	1,113	1,892	5,888	3,764
Romania	11,611	12,598	15,461	6,088	4,701	1,364
Italy	94,794	100,853	95,092	99,219	152,409	71,019
Spain	5,559	3,561	6,541	2,946	7,124	2,178
Israel	3,218	2,777	2,677	2,988	4,183	3,779
New Zealand	6,665	8,630	9,792	11,885	11,220	5,992
Australia	4,366	7,306	4,662	3,209	4,568	2,089
Japan	189,753	202,000	181,056	204,818	309,757	179,773
China (Taiwan)	1,573	2,562	2,913	3,617	5,175	2,999
China (P.R.C.)	100	86	1,381	1,949	3,113	1,404
TOTAL	\$1,773,033	\$1,549,799	\$1,179,734	\$1,347,483	\$1,729,402	\$830,109

Source: U.S. Dept. of Commerce, International Trade Administration, Office of Capital Goods and International Construction.

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IMPORTS OF FARM EQUIPMENT BY PRODUCT

Product	Jan.-Dec., 1983			Jan.-Dec., 1984			Jan.-June, 1985		
	Quantity	Value in Thousands of Dollars		Quantity	Value in Thousands of Dollars		Quantity	Value in Thousands of Dollars	
Knives & Cutting Blades	5,043,704	\$ 7,957		10,337,480	\$ 8,785		6,822,155	\$ 5,854	
Plows & Listers	2,669	5,174		2,184	5,479		1,685	1,858	
Cultivators & Weeders	17,201	18,844		16,517	17,711		10,322	8,556	
Parts of Plows, Cultivators, Weeders & Listers .....	.....	21,750		.....	30,732		.....	17,752	
Harrows, Rollers, Stalk Cutters, Soil Pulverizers	26,784	4,826		23,383	7,956		21,587	5,662	
Parts of Harrows, Rollers, Stalk Cutters, etc. ....	.....	13,548		.....	19,777		.....	6,527	
Planting, Seeding & Fertilizing Machinery	30,517	31,923		38,908	31,376		27,311	13,639	
Parts of Planting, Seeding & Fertilizing Machinery .....	.....	9,703		.....	10,716		.....	4,952	
Haying Machinery other than Mowers	7,281	10,948		6,614	11,411		5,844	7,991	
Mowers except Lawn Mowers	10,469	19,319		14,711	31,079		10,332	19,109	
Harvesting Machines, NES	7,974	81,975		10,520	82,393		6,252	38,757	
Parts of Harvesting Machines .....	.....	44,635		.....	57,903		.....	31,744	
Farm Wagons & Carts	3,939	5,339		3,041	4,148		2,226	2,735	
Agricultural Machines & Implements, NES .....	.....	96,978		.....	122,054		.....	69,285	
Parts of Agricultural Machines, NES .....	.....	60,073		.....	81,670		.....	43,578	
Tractors, Agricultural, Wheel-Type, New, excluding Industrial*	104,061	678,073		124,880	819,028		69,514	372,444	
Tractors, Agri., Used	3,548	26,786		5,457	40,525		3,701	24,376	
Parts for Agri. Tractors .....	.....	203,547		.....	323,003		.....	147,594	
Walk-Behind Rotary Tillers	NA	NA		NA	NA		2,267	920	

Source: U.S. Dept. of Commerce, International Trade Administration, Office of Capital Goods and International Construction.

NES - Not elsewhere specified.

*Use of the term "Industrial" here is understood to refer to such machines as forklifts but not to industrial tractors as commonly defined in the farm and industrial equipment industry.

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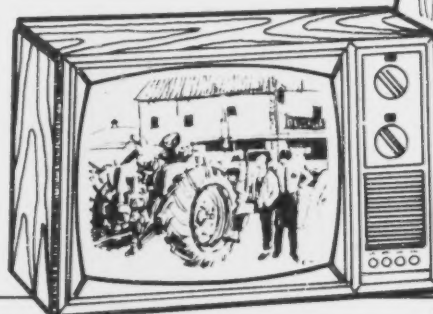
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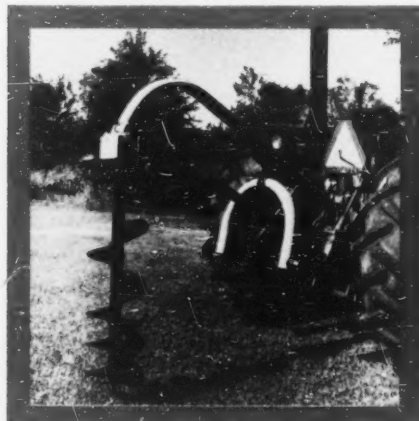


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FARM EQUIPMENT EXPORTS BY TYPE OF PRODUCT

Product	Jan.-Dec., 1983			Jan.-Dec., 1984			Jan.-June, 1985		
	Quantity	Dollar Value in Thousands		Quantity	Dollar Value in Thousands		Quantity	Dollar Value in Thousands	
Combines, pull-type	934	22,487		1,073	26,609		438	9,268	
Combines, self-propelled	2,882	125,377		3,603	161,082		2,354	100,184	
Cultivators, tractor-drawn									
or mounted	3,636	5,874		3,282	6,941		1,494	3,671	
Cultivators, NEC, and Weeders	2,504	3,804		2,758	7,671		2,379	3,338	
Farm Elevators and Blowers	1,802	5,888		1,304	4,340		668	1,843	
Farm Wagons and Carts	1,660	3,137		1,590	2,750		448	1,227	
Parts for Farm Wagons and Carts .....	.....	2,459		.....	1,543		.....	558	
Fertilizing Machines	6,711	17,266		4,421	15,120		2,355	7,210	
Forage Harvesters	2,014	25,833		1,841	23,772		1,024	12,812	
Harrows, Disk	5,208	17,879		2,294	12,941		1,076	4,810	
Harrows, NEC, & Soil Pulverizers	6,244	6,897		6,215	6,448		2,978	2,834	
Parts for Harrows, Stalk Cutters									
& Soil Pulverizers .....	.....	4,454		.....	5,547		.....	6,952	
Harvesting Machines, NEC	5,200	42,927		5,767	80,120		3,269	39,541	
Harvesting Machine Parts .....	.....	114,069		.....	140,082		.....	65,503	
Hay Balers	5,160	36,603		5,567	37,181		2,736	20,263	
Haying Machines, NEC (incl.									
rakes & tedders)	3,925	16,823		3,620	20,398		1,749	10,436	
Parts for Haying Machines .....	.....	25,109		.....	24,011		.....	8,113	
Mowers, Cutterbar, tractor-drawn	958	2,870		1,317	4,015		807	1,756	
Mowers, Rotary, tractor-drawn									
(excl. lawn mowers)	5,891	5,029		11,187	7,076		5,302	3,750	
Mowers, NEC, tractor-drawn									
(excl. lawn mowers)	1,335	3,861		1,888	7,448		1,103	4,052	
Planting Machines	4,504	5,785		6,766	10,085		2,442	5,500	
Plows, Disk	784	1,996		1,173	2,724		496	1,156	
Plows, Moldboard	2,203	6,612		2,372	7,246		865	2,942	
Plows & Listers, NEC	5,304	10,914		3,813	10,285		1,854	5,909	
Parts for Plows, Listers,									
Cultivators & Weeders .....	.....	17,774		.....	19,746		.....	5,247	
Seeding Machines	12,363	26,889		14,262	26,692		6,066	10,785	
Parts for Planting, Seeding &									
Fertilizing Machines .....	.....	16,821		.....	22,186		.....	8,258	
Farm Tractors:									
Under 40 PTO HP	637	3,299		660	3,407		283	1,586	
40-59 PTO HP	502	4,774		629	6,174		412	4,718	
60-79 PTO HP	600	8,721		882	13,084		483	4,232	
80-99 PTO HP	727	16,340		989	23,318		653	12,978	
100-119 PTO HP	1,440	46,764		842	23,918		354	9,752	
120-139 PTO HP	2,263	80,365		1,781	62,957		823	29,685	
140-159 PTO HP	1,240	46,586		1,439	53,560		581	22,421	
160-179 PTO HP	1,211	53,807		1,472	65,856		640	31,388	
180 HP & Over	1,989	117,916		2,380	150,476		978	62,732	
Other Farm Tractors	1,724	15,494		1,414	17,939		482	9,590	
Parts for Farm Tractors .....	.....	585,095		.....	672,613		.....	281,406	

Source: U.S. Dept. of Commerce, International Trade Admin., Office of Capital Goods and International Construction.
 NEC—Not elsewhere counted or classified.





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VALUE OF U.S. FARM EQUIPMENT EXPORTS BY COUNTRIES OF DESTINATION

(Value in thousands of dollars)

Country	1983	1984	Jan.-June 1985
Western Hemisphere			
Canada	\$852,317	\$891,074	\$424,920
Mexico	45,610	113,912	125,782
Guatemala	2,719	3,610	1,714
Honduras	3,200	5,890	1,745
Nicaragua	5,446	7,296	4,554
El Salvador	2,372	3,661	886
Costa Rica	3,083	6,306	2,470
Panama	3,797	2,704	1,273
Trinidad	4,064	2,544	990
Dominican Republic	6,142	5,545	2,460
Colombia	16,778	16,191	6,388
Jamaica	3,511	4,398	1,544
Venezuela	19,045	23,904	10,935
Brazil	9,048	16,423	7,855
Argentina	9,792	10,136	2,553
Bolivia	790	3,636	1,278
Chile	3,517	5,581	1,711
Ecuador	5,886	6,858	6,095
Peru	7,100	7,052	2,405
Europe			
Denmark	1,969	2,467	1,138
Sweden	8,760	9,066	1,900
United Kingdom	65,761	68,267	30,040
Netherlands	10,143	7,586	3,651
Belgium	55,046	53,832	11,377
France	97,761	89,374	32,341
West Germany	76,414	67,436	25,239
Hungary	13,203	10,955	8,390
Switzerland	2,844	3,204	1,823
Spain	7,871	10,986	5,464
Italy	6,660	8,610	4,626
Greece	7,416	22,295	8,343
U.S.S.R.	16,075	12,546	12,033
Middle East			
Israel	15,181	16,958	8,697
Kuwait	1,446	1,691	1,502
Saudi Arabia	307,795	257,307	52,778
Jordan	1,641	3,664	1,372
Asia and Pacific			
India	4,037	2,959	512
Thailand	3,247	2,650	1,336
Singapore	12,731	13,100	2,672
Indonesia	5,440	3,795	458
Sri Lanka	5,397	7,674	2,132
China (P.R.C.)	1,791	16,894	1,009
Philippines	3,432	4,045	1,060
Korea	5,098	5,236	1,955
Japan	20,001	20,196	10,826
Australia	97,970	214,075	68,723
New Zealand	5,489	5,293	1,540
Africa			
Algeria	6,917	5,133	2,337
Libya	3,276	19,687	12,754
Sudan	10,081	4,498	1,033
Nigeria	1,668	2,538	1,923
Egypt	13,092	11,436	9,516
Rep. South Africa	57,023	59,537	14,997
Total U.S. Exports, Farm & Industrial Equipment	\$2,014,069	\$2,235,014	\$982,284

Source: U.S. Dept. of Commerce, International Trade Admin., Office of Capital Goods and International Construction

USE I&T's HANDY REPLY CARD

Dealers and Their Associations

■THE BEST thing about a dealer association convention is the chance to talk shop informally with other dealers, according to the For Dealers Only survey in the August issue of I&T.

The least favored activity was hearing presentations of annual reports by association officers.

A total of 65 dealers responded to the survey, and all but three said they belong to their state, provincial or regional dealer association. Twenty-nine had attended each association convention from 1980 through 1985, and another 29 had attended several conventions but not all during that span.

There must be something worth doing at conventions, because 52 of the dealers said they plan to attend next year.

The survey form, carried inside the front cover of the issue, asked the dealers to rank the importance

How Dealers Rate Convention Activities

Dealers specified the importance to them of these activities, assigning numbers corresponding to highest, neutral and lowest importance.

Activity	Highest	Neutral	Lowest
Professional speaker to motivate, inspire, raise morale	24	11	5
Panels of fellow dealers on management and related topics	25	12	2
Workshops by specialists in fields such as accounting, management, computers, selling skills, marketing, etc.	29	12	0
Talks by representatives of equipment manufacturers	9	20	12
Presentation of annual reports by association officers	1	10	30
Informally "talking shop" with other dealers	34	4	3
Exhibits by equipment manufacturers	7	19	16

of various traditional convention activities, and the clear winner was an item about "Informally 'talking shop' with other dealers"—given top ranking by 34 of the 42 dealers who correctly marked up that section of

the survey.

The results of that dealer rating is carried in the accompanying table—and might provide some guidance for convention planning committees.



When It Comes To Farm Implement Parts—Beall Covers The Field.

Beall Manufacturing is a major domestic supplier of high-quality precision-engineered agricultural implement parts—standard or custom-made—to fit OEM specifications. All Beall products are backed by years of manufacturing experience.

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AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

JONES FARM EQUIPMENT CO. Dothan, Alabama September 10, 1985

DEUTZ TRACTOR

3006 diesel, (Good) 2500*

MASSEY-FERGUSON TRACTORS

2675 diesel, 1979 (Fair) 6000
1130 diesel, 1971 (Fair) 2700
1105 diesel, 1973 (Good) 3900*
1085 diesel, 1967 (Fair) 2750*
285 diesel, 1975 (Good) 6800
165 diesel, 1969 (Rough) 2200
165 diesel, 1968 (Fair) 2600
165 diesel, 1968 (Good) 3100
165 diesel, 1967 (Rough) 2150
165 diesel, 1967 (Good) 3100
165 diesel, 1966 (Good) 3100*
135 diesel, 1967 (Fair) 1900
65, 1967 (Good) 2000*
35, 1960 (Good) 1500

FORD-FERGUSON TRACTOR

9N, 1942 (Rough) 540

FORD TRACTORS

7700 diesel, 1979 (Good) 7500
7700 diesel, cab, duals, 1979
(Good) 7750*
6600 diesel, 1975 (Good) 4000
5000 diesel, 1970 (Fair) 3550
5000 diesel, 1970 (Fair) 3500
5000 diesel, 1968 (Rough) 2300
4600 diesel, 1976 (Good) 3700*
4100 diesel, 1970 (Good) 3800
4000 diesel, 1974 (Excellent) 4750
4000 diesel, 1973 (Excellent) 4200
4000 diesel, 1967 (Good) 3350
4000 diesel, 1966 (Fair) 2800
4000 diesel, 1966 (Rough) 2300
4000 diesel, 1966 (Rough) 2000*
3000 diesel, 1968 (Good) 3000
3000 diesel, 1968 (Good) 3150
3000 diesel, 1968 (Good) 2900
3000 diesel, 1967 (Good) 3000
3000 diesel, 1966 (Rough) 2200
3000 diesel, 1966 (Rough) 1950
3000 diesel, 1966 (Rough) 2200*
2000 diesel, 1967 (Good) 2600
2000 diesel, 1967 (Good) 2550*
2000 diesel, 1966 (Fair) 2300*
741, 1958 (Good) 1200
641, 1958 (Fair) 1425
8N, 1952 (Fair) 1200
8N, 1952 (Good) 1500
8N, 1951 (Good) 1375
8N, 1948 (Rough) 775
8N, 1948 (Fair) 950

INTERNATIONAL HARVESTER TRACTORS

2410 diesel, (Good) 2500
784 diesel, cab, 1979
(Excellent) 5850
784 diesel, cab, 1978 (Good) 5000
784 diesel, cab, 1978 (Good) 4750*
784 diesel, 1978 (Good) 5100*
684 diesel, cab, 1978 (Good) 4850
684 diesel, cab, 1978 (Good) 4875
674 diesel, 1977 (Good) 4300

674 diesel, cab, 1977 (Excellent) 5300
674 diesel, 1977 (Excellent) 5000
674 diesel, 1976 (Good) 3900
674 diesel, 1973 (Good) 3900
674 diesel, 1973 (Fair) 3700
574 diesel, cab, 1976 (Good) 3750
574 diesel, 1975 (Good) 4300
574 diesel, 1975 (Good) 3900
574 diesel, 1975 (Good) 3900
454 diesel, 1973 (Good) 4300
444 diesel, 1968 (Rough) 1500
444 diesel, 1967 (Fair) 2200
444 diesel, 1967 (Rough) 1500*
B414 diesel, 1963 (Good) 1600*
350, 1957 (Fair) 625
300, 1955 (Fair) 825*
B275 diesel, 1960 (Good) 1300*
184 diesel, 1977 (Fair) 2300
Hyd 84 diesel, 1979 (Good) 4700
Cub Loboy, 1958 (Fair) 1400*
Cub, mo., 1949 (Good) 1500*

JOHN DEERE TRACTORS

4440 diesel, cab, 1978
(Excellent) 16,000*
4240 diesel, 1979 (Excellent) 11,000*
4020 diesel, 1966 (Fair) 3500
3130 diesel, cab, (Good) 4650
2640 diesel, 1978 (Excellent) 6000
2520 diesel, 1970 (Good) 5100*
2130 diesel, cab, (Good) 4000*
2130 diesel, cab, (Good) 4000*
2030 diesel, 1974 (Good) 4600*
2030 diesel, 1974 (Good) 4300
2030 diesel, 1972 (Fair) 3550
2020 diesel, 1965 (Good) 3450
2010 diesel, 1965 (Good) 1400
1120 diesel, (Good) 3500*
1120 diesel, (Fair) 3000
1020 diesel, 1966 (Good) 2825
1010 diesel, 1961 (Rough) 750
MT, 1951 (Good) 725

OLIVER TRACTORS

1365 diesel, 1975 (Fair) 2350*
550 diesel, 1961 (Good) 1800*

YODER & FREY, INC. Archbold, Ohio September 10, 1985

JOHN DEERE TRACTORS

A, 1952 (Rough) 370
B, 1942 (Rough) 310
GP, ... 675
B, 1949 (Fair) 1525
MT, ... 450
70, 1955 (Rough) 775*
70, 1954 (Fair) 1050*
730, 1958 (Good) 2000*
2020, 1972 (Good) 4775*
2440 diesel, 1979 (Good) 9500*
2840 diesel, 1978 (Good) 7500*
3020 diesel, 1964 (Good) 3600*
4010, 1964 (Fair) 3800
4020 diesel, 1965 (Good) 6000*
4020, 1967 (Good) 3700*
4020 diesel, 1965 (Good) 6100*
4020, 1966 (Good) 3000*

4020, 1967 (Good) 5750*
4020, 1965 (Rough) 2450*
4020, 1967 (Good) 2800
4230, 1974 (Good) 7900*
4320, 1972 (Good) 11,000*
4430, 1976 (Good) 12,100*
4440, 1980 (Excellent) 17,750*
4520 diesel, 1969 (Rough) 4900*
4630, 1975 (Good) 7000*
5020 diesel, 1969 (Fair) 3600
5020 diesel, 1970 (Fair) 3500

OLIVER TRACTORS

77, 1950 (Fair) 390*
77, 1952 (Fair) 375*
1650, 1966 (Fair) 2550
1755, 1973 (Good) 3900
1850, 1969 (Fair) 2100*
1855 diesel, 1973 (Fair) 3400*
1955 diesel, 1973 (Fair) 4800
1955 diesel, 1973 (Fair) 4100*
1955 diesel, 1972 (Good) 3700*
2255, 1973 (Fair) 5200*

CASE TRACTORS

400, 1957 (Fair) 1025*
730, 1965 (Fair) 1850
830, 1966 (Rough) 1250*
830 diesel, 1966 (Rough) 1000*
930 diesel, 1966 (Rough) 575*
1170, 1971 (Rough) 2400*
1170, 1971 (Rough) 4500*
990, 1962 (Rough) 1600*
1200 diesel, 1970 (Fair) 2400

MINNEAPOLIS-MOLINE TRACTOR

G-900, 1968 (Rough) 1800*

INTERNATIONAL HARVESTER TRACTORS

C, cult., 1950 (Fair) 750*
Cub, mo., (Rough) 850*
Cub, 1950 (Rough) 800*
Cub, 1947 (Fair) 690
H, 1948 (Rough) 450*
H, 1942 (Fair) 400
MTA, 1950 (Fair) 600
M, 1949 (Fair) 350
M, 1949 (Fair) 510
M, 1948 (Fair) 625*
M, 1950 (Fair) 800*
M, 1946 (Fair) 650
Sup. M, 1952 (Fair) 710
230, 1957 (Fair) 1050*
350, ldr., (Rough) 725
400 diesel, 1957 (Rough) 550
400, 1957 (Rough) 410
450, 1950 (Rough) 550
460, 1959 (Rough) 775*
504, 1965 (Fair) 1575*
560, 1958 (Rough) 1300*
560, diesel, 1960 (Fair) 1500*
560, 1962 (Fair) 1600*
560, 1962 (Fair) 900*
656, 1970 (Fair) 3300*
656, 1970 (Fair) 2900
656, 1969 (Fair) 4000
624, (Rough) 2000
674, (Good) 7400*
706, 1964 (Fair) 1825
706, 1965 (Fair) 3200*
806, 1965 (Fair) 3750*
826, 1970 (Good) 3800*
856, 1968 (Rough) 3000*
966, 1973 (Fair) 4450

986, 1979 (Good) 11,000*
1066 diesel, 1974 (Fair) 5200
1066 diesel, 1975 (Fair) 5250*
1066 diesel, 1975 (Rough) 4300*
1206, 1965 (Fair) 4100*
1466, 1975 (Fair) 6500*
1466, 1972 (Good) 8500*
1466, 1973 (Fair) 5000
1466, 1972 (Good) 7200*
1466, 1974 (Good) 6100*
1466, 1973 (Good) 6000*
4556, 1979 (Fair) 13,500*
4366, 1975 (Good) 7750*
4100, (Rough) 3000*

DEUTZ TRACTOR

D 4506, 1972 (Fair) 1960

COCKSHUTT TRACTOR

1550, 1965 (Fair) 2600*

FORD TRACTORS

8N, 1950 (Rough) 800*
8N, 1949 (Rough) 690
8N, 1951 (Rough) 425*
9N, 1944 (Fair) 1250
9N, 1946 (Fair) 925*
9N, 1943 (Fair) 1900*
880, 1955 (Rough) 1600*
3000, 1965 (Fair) 2450
3000, 1965 (Fair) 2700*
3000, 1965 (Rough) 1600
3000, ldr., 1967 (Fair) 3950
4000, 1972 (Good) 3600*
5000, 1970 (Fair) 5000*
5000, 1966 (Rough) 3000*
5000, 1965 (Fair) 3600*
6000 diesel, 1961 (Rough) 1325

FERGUSON & MASSEY-FERGUSON

35, 1963 (Fair) 1975*
50, 1963 (Rough) 1550*
50, 1958 (Fair) 1825
50, ldr., 1962 (Rough) 1250*
65, 1960 (Fair) 1350*
65, 1965 (Rough) 1375
165, 1967 (Rough) 2300
165, 1970 (Fair) 2700
165, 1970 (Rough) 2400*
165, 1967 (Fair) 3100*
180, 1972 (Good) 4000*
180, 1969 (Rough) 2475
1155, 1977 (Fair) 4750*

ALLIS-CHALMERS TRACTORS

C, 1948 (Fair) 800*
WD, 1948 (Fair) 575
WD, 1949 (Fair) 600*
WD-45, 1952 (Rough) 275
D-14, 1960 (Fair) 1275*
D-15, 1967 (Fair) 2200*
D-17, 1967 (Fair) 1900*
D-21 (Fair) 2450*
190XT, 1969 (Fair) 3000*
190XT, 1968 (Fair) 4000*
200, 1972 (Good) 5500*
7000, 1976 (Fair) 6300*
7030, 1976 (Fair) 4550*
7060, 1976 (Fair) 6900*

WHITE TRACTORS

2-60, (Rough) 4100
2-85, 1976 (Fair) 7000*
2-105, 1976 (Fair) 7000*
2-135 diesel, 1975 (Fair) 7500*

Implement & Tractor

The business magazine of the farm and industrial equipment industry

DECEMBER 1985

Parts Managers Told to Watch Costs page 20



Pioneer Technology's Seed Computer Wins I&T Design Competition

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A Look Inside the
Allied-White Deal
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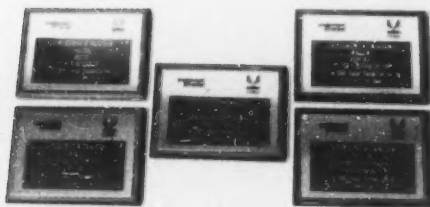
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- 8: The 1985 I&T Design Awards.** Profiles on the products that were selected in our second shortliner design awards competition.
- 12: Big Changes in Business Coverages.** Hurt by court decisions in liability cases, insurers are making adjustments in their policies. Be prepared for significant cutbacks.
- 14: New Bosses at White Farm Equipment See Stable Future with Allied.** In an exclusive interview with I&T, executives of White Farm Equipment Co. and Allied Products Corp. discuss the future with White out of bankruptcy and in the Allied fold.
- 16: There's No Business Like Niche Business.** Tractor makers play to specialized markets with new versions.
- 18: Handle Complaints by Listening.** A report of responses from the For Dealers Only survey on handling customer complaints.
- 20: The Davis Report: Factory Service Too Darn Costly.** The FIEI parts committee hears the latest analysis of their operations.
- 22: The Big 6.** Deutz-Allis's Roy Uelner takes a look at half a dozen central issues affecting the industry's future.
- 25: Deutz-Allis Parts Program Goes After 'Will Fit' Sales.** The Value Line program from D-A will expand to filters and possibly other products.
- 30: Factories Find Frustration in Building Computer Networks.** Grand plans abound for getting every dealer computerized inside and out. But planners find it's not easy to get machines, and people, to talk to each other.

On the cover...The sensor portion of Pioneer Technology's seed computer, winner of I&T's 1985 Design Awards.

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October U.S. Retail Sales Soft; Smaller Tractors Only Highlight

Tractor sales through the first 10 months of 1985 stand about even in terms of total units, according to the flash report of the Farm & Industrial

Equipment Institute, but the strength has been concentrated in the under-40 and the 40-99 horsepower brackets. October

volume was off sharply for over-100-hp, two-wheel-drive tractors as well as for all implement groups reported.

	Unit Retail Sales					
	October		Pct. Change	January-October		Pct. Change
	1985	1984		1985	1984	
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	4,559	4,428	+ 3.0	50,710	44,591	+ 13.7
40-99 hp	3,550	3,441	+ 3.2	32,988	32,833	+ .5
100-139 hp	480	1,195	- 59.8	6,438	8,275	- 22.2
Over 140 hp	781	1,856	- 57.9	8,770	12,271	- 28.5
Total 2-wheel drive	9,370	10,920	- 14.2	98,906	97,970	+ 1.0
4-wheel drive						
Under 200 hp	103	101	+ 2.0	739	1,266	- 41.6
Over 200 hp	138	148	- 6.8	1,408	2,074	- 32.1
Total 4-wheel drive	241	249	- 3.2	2,147	3,340	- 35.7
Total All Tractors	9,611	11,169	- 13.9	101,053	101,310	- .3
S-P Combines	1,340	2,185	- 38.7	6,248	8,751	- 28.6
Balers (under 200-lb. bales)	277	409	- 32.3	6,556	7,778	- 15.7
Forage Harvesters (shear-bar type)	391	693	- 43.6	2,147	3,085	- 30.4
Mower-Conditioners	548	702	- 21.9	10,359	12,216	- 15.2

Case Production Shift: Two Models To Doncaster, U.K.

J I Case Co., with help in the form of a grant from Britain's Dept. of Trade and Industry, will shift production of two tractor models from its Racine factory to Doncaster, U.K.

Production of combine and cotton picker transmissions, which had been made in the former IH Farmall plant in Rock Island, Ill., will also shift to Doncaster.

Transfer of production is expected to be completed in the fourth quarter of 1986. Tractors involved are the 95-hp model 1896 and the 115-hp 2096. The Doncaster factory was acquired by Case as part of its purchase of International Harvester's Agricultural Equipment Div. early in 1985.

According to London's *Financial Times*, Case expects to invest \$128 million and create about 2,000 jobs in Britain in the next five years. Case officials were said to be looking at the possibility of transferring some production from the U.S. to their plants in France and West Germany.

Shifting production of the

two tractors involves \$58 million and the creation of 300 to 500 jobs at Doncaster, where IH's factory had been closed in 1982.

Last year, Case produced 23,300 tractors in Britain, compared with U.K. outputs of 56,300 units by Massey-Ferguson and 35,900 by Ford Tractor.

Hesston Posts Loss In Third Quarter

In the third quarter of fiscal 1985, ended Sept. 30, Hesston Corp. had sales of \$38 million and a loss of \$6.6 million, compared with last year's \$40 million in sales and a loss of \$4.5 million. For the nine months, the loss was \$9.9 million on sales of \$122 million, compared with 1984's sales of \$145 million and a \$1.8 million loss.

In this year's third quarter, Hesston accrued \$2.2 million for the cost of moving production from its Woods Div. plants in Illinois to the main facility at Hesston, Kan.

Melvin H. Voth, senior vice-president for finance, has resigned from Hesston. He is

replaced by Guido Orru, a veteran Fiat executive. Hesston is majority-owned by Fiat of Torino, Italy.

Exports, Imports Off '84 Pace in First 9 Months

For the first nine months of 1985, both imports and exports of farm machinery were off the 1984 pace through the same period, according to the U.S. Dept. of Commerce.

Imports, at \$1.198 billion, were off 12 per cent. Export volume, at \$1.429 billion, was down 17 per cent from the 1984 nine-month level.

Major customers for U.S. products: Canada—\$611 million; Mexico—\$182 million; Australia—\$101 million; Saudi Arabia—\$78 million; France—\$46 million; United Kingdom—\$42 million; West Germany—\$38 million.

Leading sources of imports to the U.S.: Canada—\$322 million; Japan—\$263 million; West Germany—\$171 million; United Kingdom—\$161 million; Italy—\$102 million; France—\$52 million; Netherlands—\$27 million.

Deere & Co. Buying Versatile Ag

Two leaders in 4WD tractors would merge under an agreement announced Dec. 10 for Deere & Co. to buy the ag machinery division of Versatile Corp.

Deere said it expects to move 4WD production to the Versatile plant at Winnipeg, Manitoba. Deere would also get the Versatile plant at Nobleford, Alberta, which makes drills and cultivators, and the Versatile Credit Corp., which ended 1984 with 6,052 accounts worth \$126 million (Canadian.)

No cash amounts were announced, but a source said the buyout amount would include the credit company value and the value of existing factories and distribution facilities—a total exceeding \$200 million in U.S. currency.

Deere said Versatile dealers would retain their identity and product, while Deere dealers would get a "differentiated line of products."

Among Versatile products targeted for Deere are the 200 series of "bi-directional" 4WD tractors, currently including two models of 80 and 100 pto hp.

The buyout agreement requires approvals of U.S. and Canadian government agencies. The companies expect to maintain current employment levels at both firms' facilities. Deere's Waterloo, Iowa, plant would lose assembly of 4WD tractors, but would gain added work building components for the machines assembled in Canada.

Briefly...

Deere & Co. will be moving toward outsourcing in an effort to circumvent high costs of domestic UAW plants, believes Wertheim & Co.'s Mitchell I. Quain. He thinks write-offs are possible in two areas, components manufacturing and earthmoving equipment, which would reduce book value (now in the low \$30s). "Should book value decline, a fall in the stock is a good possibility," he says.



AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

YODER & FREY, INC. Archbold, Ohio October 8, 1985

INTERNATIONAL HARVESTER TRACTORS

C, (Rough)	625
H, 1950 (Fair)	575*
M, 1950 (Rough)	775*
M, 1948 (Fair)	600*
Sup. MTA, pkr, 1951 (Fair)	2300
W9, (Rough)	210
Sup. M, 1952 (Fair)	700
454, 1972 (Fair)	5400*
460, 1951 (Rough)	1075
464, diesel, 1974 (Fair)	3400*
574, ldr., 1974 (Rough)	2800
666 diesel, 1974 (Fair)	5300*
756 diesel, 1970 (Fair)	4200
806, 1964 (Fair)	3300*
806, 1966 (Fair)	3300*
966, 1976 (Good)	6250*
1026, 1970 (Good)	4150
1066, 1975 (Fair)	5000*
1206 diesel, 1963 (Fair)	3500*
1466 diesel, 1973 (Good)	7000*
1466 diesel, 1972 (Fair)	5700*
1466 diesel, 1975 (Good)	6400
1466 diesel, 1972 (Good)	6700*
1566 diesel, 1971 (Fair)	8750*
1566 diesel, 1974 (Fair)	8000*
4100, (Rough)	2800*
4366 diesel, 1974 (Good)	7750*
4586 diesel, 1977 (Fair)	11000*

ALLIS-CHALMERS TRACTORS

C, 1949 (Fair)	550*
WD, 1947 (Rough)	575*
D-15, 1967 (Fair)	1600*
200 diesel, 1972 (Good)	5500*
7060 diesel, 1975 (Good)	7000*

JOHN DEERE TRACTORS

70, 1956 (Rough)	650*
70, 1954 (Fair)	1075
70, 1955 (Fair)	650
70, 1956 (Rough)	750*
530, 1959 (Fair)	1750

730, 1958 (Good)	1800*
1010, ldr., (Rough)	700
1020 diesel, 1973 (Fair)	4100*
3020, 1967 (Good)	3850
4010 diesel, 1964 (Fair)	3750
4020, 1966 (Good)	3550
4020 diesel, 1966 (Good)	5700*
4020 diesel, 1964 (Fair)	4500*
4320 diesel, 1972 (Good)	8250*
4430 diesel, 1977 (Good)	11,000*
4430 diesel, 1979 (Good)	11,750*
4430 diesel, 1976 (Fair)	8100
4430 diesel, 1975 (Fair)	9250*
4620 diesel, 1972 (Fair)	6700*
4620 diesel, 1973 (Rough)	4900
4620 diesel, 1972 (Good)	6800*
7520 diesel, 1972 (Rough)	9000*

MASSEY-FERGUSON TRACTORS

35, 1960 (Fair)	2100*
50, ldr., 1957 (Rough)	1600*
165, 1972 (Fair)	2500
165, 1968 (Rough)	2450
165, 1969 (Rough)	2300*
165, 1968 (Rough)	2800*
245, ldr., 1979 (Fair)	6300*
1155 diesel, 1975 (Fair)	4500*

CASE/DAVID BROWN TRACTORS

990 diesel, 1962 (Rough)	1400
930 diesel, 1965 (Fair)	1575
930 diesel, 1967 (Fair)	2500*
1070 diesel, 1973 (Rough)	2100*

FORD TRACTORS

8N, 1944 (Fair)	950
8N, 1942 (Fair)	950
8N, 1951 (Rough)	1000*
9N, 1944 (Fair)	825
600, 1955 (Fair)	1800
3000 diesel, 1965 (Fair)	3500
3000 diesel, 1966 (Rough)	2650*
3000 diesel, 1972 (Good)	3600*
3400, ldr., 1970 (Fair)	4600*
3400, ldr., 1972 (Fair)	2975
4000, 1971 (Fair)	3400*
4400, ldr., 1973 (Rough)	3400
5000 diesel, 1973 (Good)	4550
5000, 1970 (Fair)	2675*

5000 diesel, 1972 (Rough)	3900*
6100 diesel, 1960 (Rough)	1300
7000 diesel, 1974 (Fair)	5600*

DEUTZ TRACTOR

D 6806, ldr.	8500
--------------	------

OLIVER TRACTORS

77, 1950 (Fair)	435
550, 1960 (Fair)	2200*
70, 1940 (Fair)	300
1850 diesel, 1967 (Rough)	1800*
1855 diesel, 1973 (Fair)	3800
1955 diesel, 1972 (Fair)	3800
1955 diesel, 1972 (Fair)	3450
2255 diesel, 1973 (Fair)	5200*

WHITE TRACTORS

2-85 diesel, 1976 (Fair)	6500*
2-105 diesel, 1977 (Fair)	6500*

STEIGER TRACTORS

Bearcat diesel, Ser. II, 1975 (Good)	8000*
Bearcat diesel, Ser. II, 1974 (Fair)	6750*

JONES FARM EQUIPMENT CO. Dothan, Ala. October 8, 1985

CASE TRACTORS

1370 diesel, 1973 (Good)	8000*
1210 diesel, 1973 (Good)	2640

MASSEY-FERGUSON TRACTORS

1155 diesel, duals, 1975 (Fair)	3800
1085 diesel, 1975 (Fair)	3400
1080 diesel, 1970 (Fair)	3300
282 diesel, 1964 (Excellent)	8500*
275 diesel, 1975 (Fair)	3600
175 diesel, 1968 (Good)	3550
165 diesel, 1974 (Rough)	1850
165 diesel, 1968 (Good)	3150*
135 diesel, 1970 (Fair)	2500
135 diesel, 1967 (Good)	3500*

135 diesel, 1967 (Fair)	2450
-------------------------	------

FORD TRACTORS

8600 diesel, 1975 (Rough)	2400
4600 diesel, 1975 (Good)	4100*
4100 diesel, 1969 (Good)	3750
4000 diesel, 1963 (Fair)	1425
3000 diesel, 1970 (Good)	3400
3000 diesel, 1968 (Fair)	2600
2000 diesel, 1966 (Fair)	2750*
2000 diesel, 1966 (Rough)	2300*
640, 1956 (Rough)	575
541 diesel, cult., 1958 (Good)	1100*
Jub., 1953 (Good)	1500*
8N, 1948 (Fair)	925
8N, 1948 (Fair)	900

INTERNATIONAL HARVESTER TRACTORS

784 diesel, cab, 1978 (Good)	5300*
444 diesel, 1970 (Good)	3100*
434 diesel, 1967 (Rough)	1150*
B414 diesel, 1963 (Excellent)	2300*
B275 diesel, 1960 (Good)	1000*
Sup. A, mo., 1954 (Good)	980
Cub, mo., 1949 (Good)	1500*

JOHN DEERE TRACTORS

4240 diesel, cab, 1979 (Excellent)	10,000*
4230 diesel, cab, 1975 (Good)	8800
4030 diesel, cab, 1974 (Good)	8400
4020 diesel, 1965 (Rough)	2800
2510 diesel, ldr., 1967 (Good)	3000
3120 diesel, (Good)	3900
3120 diesel, (Good)	3900
2130 diesel, (Rough)	2800*
2030 diesel, 1974 (Good)	5150
2020 diesel, 1968 (Excellent)	3850*
2310 diesel, 1962 (Good)	1200*
50 LP, 1955 (Good)	600*

LONG TRACTORS

560 diesel, (Rough)	975*
360 diesel, 1976 (Good)	2200

OLIVER TRACTORS

1600 diesel, 1963 (Rough)	775
1365 diesel, 1975 (Fair)	1800

NOTES:

Prices reported are for individual sales at wholesale on an "as is," "cash and carry" basis. Prices reported are not averages.

Condition Classifications:

EXCELLENT: Engine in perfect condition, 400 to 600 hours of use. Rubber—80% tread remaining, no breaks or cracks. Paint—original and bright. General appearance: excellent.

GOOD: Engine in good running condition. Rubber—70% tread remaining, no

breaks or cracks. Paint—original or a good repaint job. General appearance: good over-all.

FAIR: Engine possibly in need of a minor overhaul. Rubber—60% tread remaining, some cracking evident in sidewalls. Paint—only fair, weathered and some rust apparent. General appearance: worn, some dents, minor parts (gage covers, etc.) missing or broken.

ROUGH: Engine obviously in need of a major overhaul. Rubber—smooth. Paint—scarred, weathered, rusty. General appearance: dents, ruptures, broken parts, loose wires, components (such as lights) broken, missing or inoperative.

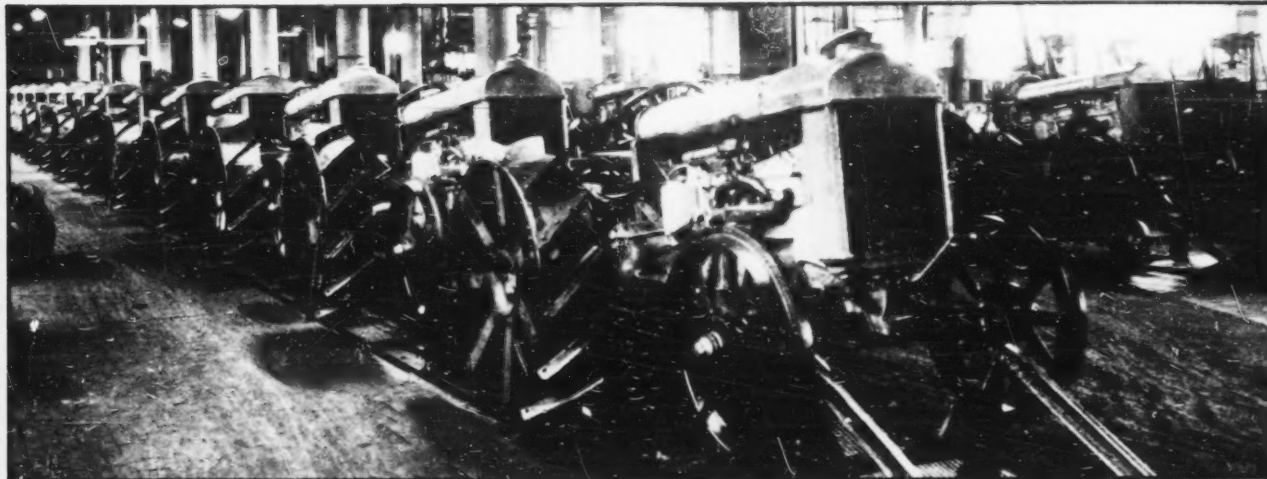
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JANUARY 1986



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Service Managers Salary Survey
page 20

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January 1986 • Vol. 101 • No. 1

21st Engineering Concepts Issue: TOP IDEAS OF THE PAST 100 YEARS

- 8: A Grand Parade.** The significant developments in farm machinery through the last 100 years is reviewed by a panel of experts with photos from the files of I&T as we begin our centennial year of publication.
- 14: More to Come!** Machinery developments have brought agriculture a long way in 100 years, and even more change is seen on the horizon.
- 18: Diversified for Extra Sales.** In slack times, it's tempting to go for extra sales by adding new lines. Here's a dealership that's learned to diversify without getting in trouble.
- 20: What Service Managers Earn.** Results of an I&T FDO survey on service managers' earnings show it's not the length of service but the number of people supervised that brings financial gain.
- 32: When Wholesalers and Manufacturers Talk It Over . . .** they like to explore trends in marketing, but they don't come to many firm conclusions—which is probably the way it should be.
- 33: FEMA Elects Greenburg.** New leaders are elected for FEMA, and members hear the latest on the state of the industry.
- 35: Wholesalers: Dick Price is President.** Officers were elected and dating sessions held at the FEWA convention.
- 36: AIMRA Adjusts to Market Shifts.** Changes in the business of repping ag products highlighted the group's annual session.

On the cover... Iron wheels and mass production marked the farm machinery business at the old Ford tractor assembly works; today and in the future it's the computer like this test station at Deere & Co.'s assembly works.

DEPARTMENTS

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November: 1985's Big Chill Continues

Retail sales of farm equipment in the U.S., according to the FIEI flash report, were

down in all listed product categories but one: four-wheelers under 200 hp improved! The worst department: two-wheel-drive tractors over 100 hp.

	Unit Retail Sales			Unit Retail Sales		
	November	Pct.	Change	January-November	Pct.	Change
	1985	1984		1985	1984	
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	3,057	3,098	- 1.3	53,760	47,689	+ 12.7
40-99 hp	2,296	2,659	- 13.7	35,281	35,492	- .6
100-139 hp	367	830	- 55.8	6,804	9,105	- 25.3
Over 140 hp	890	1,481	- 39.9	9,656	13,752	- 29.8
Total 2-wheel drive	6,610	8,068	- 18.1	105,501	106,038	+ .5
4-wheel drive						
Under 200 hp	92	89	+ 3.4	830	1,355	- 38.7
Over 200 hp	137	144	- 4.9	1,545	2,218	- 30.3
Total 4-wheel drive	229	233	- 1.7	2,375	3,573	- 33.5
Total All Tractors	6,839	8,301	- 17.6	107,876	109,611	- 1.6
S-P Combines	1,139	1,786	- 36.2	7,491	10,537	- 28.9
Balers (under 200-lb. bales)	245	330	- 25.8	6,801	8,108	- 16.1
Forage Harvesters (shear-bar type)	194	297	- 34.7	2,348	3,382	- 30.6
Mower-Conditioners	478	498	- 4.0	10,836	12,714	- 14.8

MF Plans Combines Venture; 9-Month Sales \$1.06 Billion

Massey-Ferguson Ltd. intends to recapitalize its Combines and Foundries divisions as a privately held associate company in which M-F would hold a minority 40 per cent interest and the balance would be held by lenders and other parties.

The new entity, to be renamed "Massey Combines Corp.," would have total assets of about \$350 million (U.S.) and debt and other obligations of about \$240 million as of last Oct. 31, the date on which the reorganization would be effective for accounting purposes.

The company would produce and market MF's conventional combine line as well as the rotary combine line recently acquired from White Farm Mfg. Canada. In addition to the rotary currently on the market, a smaller version is under test and scheduled for 1986 production.

All elements of the plan are subject to approval by MF shareholders. According to Victor A. Rice, the operation should be able, under the plan, to return to profitability in 1987.

For the quarter ended Oct. 31, MF had a net profit of \$6.1 million on sales of \$380 million, compared with earn-

ings of \$4.4 million and sales of \$359 million in the same 1984 period. For the nine months, net income of \$600,000 was reported on sales of \$1.06 billion after one-time charges of \$7.6 million for European plant closings.

Through the first nine months, the Combines and Foundries Divs. lost approximately \$35 million. Without these losses, MF nine-month earnings would have been about \$36 million on restated sales of \$937 million.

Deere's 85: Net of \$30 Million, Sales Of \$4.1 Billion

Deere & Co. had sales for the 1985 fiscal year, ended Oct. 31, of \$4.1 billion, down 8 per cent from 1984's \$4.4 billion, and net income of \$30.5 million compared with \$105 million a year earlier.

In the fourth quarter, sales were \$1.1 billion, down 7 per cent, and net income was \$19.4 million, compared with \$34 million in 1984.

The company incurred a pretax loss of \$129 million from manufacturing and marketing operations in 1985 compared with \$14.6 million in 1984. Chairman Robert Hanson cited low utilization of manufacturing capacity and retail sales incentive costs as

causes of the loss. The company benefitted from reductions in LIFO industries in the amount \$62 million.

In 1986, Deere intends to reduce North American farm equipment production, but output of industrial equipment, overseas farm equipment and grounds care products are scheduled to increase. Total production will decline slightly.

Finance, leasing and insurance subsidiaries had net income of \$86 million, up \$4 million from 1984. Farm equipment sales for the year were \$3.1 billion, down 11 per cent. Industrial equipment volume rose 5 per cent to \$943 million.

Dealer receivables declined by \$117 million during the year to \$2.7 billion.

Allied, Case Extend Hay Tools Contract

Chicago-based Allied Products Corp. has entered into a three-year contract extension with Case/International for their hay equipment requirements to be produced at Allied's New Idea Farm Equipment Div., Coldwater, Ohio.

Allied recently signed purchase agreements with Lely (Netherlands) for disk mower components and Rivierre Casalis (France), a subsidiary

Front-Wheel Assist On 42% of Canadian Units Sold in '85

According to the Canadian Farm & Industrial Equipment Institute, 42 per cent of the 18,177 two-wheel-drive tractors sold in Canada in 1985 were equipped with front-wheel assist.

For 1986, the CFIEI's outlook statement predicts a similar market share for power front axles—7,560 of them on 17,850 units.

In 1985, 64 per cent of the 3,833 units under 40 hp had FWA; 39 per cent of the 8,818 units from 40 to 99 hp had it; for units of 100 hp and over, 31 per cent of 5,526 units.

Total Canadian tractor sales in 1985 were an estimated 20,491; the 1986 outlook is for 20,126 unit sales. Other major products:

Self-propelled combines—2,322 units in 1985, 2,234 in 1986. Self-propelled swathers—2,000 in 1985, 1,843 for 1986. Rectangular balers—1,791 in 1985, 1,722 for 1986. Round balers—2,037 in 1985, 2,033 for 1986. Mower-conditioners—2,143 in 1985, 2,109 for 1986.

Briefly...

Steiger Tractor Co. has a net loss of \$8 million on sales of \$80.3 million in the fiscal year ended Sept. 30. In 1984, Steiger had income of \$1.9 million on sales of \$122 million.

Marianna Pratt, managing editor of *Agricultural Engineering* magazine, was killed Nov. 26 in an auto accident in St. Joseph, Mich. She had been with the American Society of Agricultural Engineers for over 20 years.

Assets of Howard Rotavator, the U.K. manufacturer of tillage and other farm equipment, have been acquired by Dowdeswell Engineering Co. Ltd., Stockton, Warks., U.K., producer of cultivation equipment.

of Renault, for purchase of rectangular balers. New Idea is projecting a 1986 annual sales volume from these contracts in excess of \$20 million.

Editor's Notebook



Bill Fogarty

How Do You Celebrate Your 100th Birthday?

I&T is now in its 100th year. First issue came off the press in April, 1886, and contrary to what some people may think, I had nothing to do with it.

About a year ago, as we saw the century mark for this magazine coming up fast, our staff was kicking ideas around this place as to how we should treat the birthday editorially. There were plenty of good ideas, but the two that stuck to the wall most forcefully were these:

- Not many readers are interested in who founded this magazine or who owned it and ran it over the years. Even fewer readers would be interested in reading boring letters of tribute from politicians and other big shots, which are easy enough to hustle up but which don't say much.

- But many of our readers are interested in where the industry has come from and where it might be going.

And so in this issue, which kicks off our observance, rather than focus on our own company, we're taking a look first of all at the most vital products this industry has brought to agriculture over the past century, followed by

some glimpses into tomorrow's potential agricultural technology. In our April issue, we'll be visiting with some people whom we consider very thoughtful and very important to this industry, seeking their views on several aspects of our future. We'll try to make it something special our readers will want to keep.

That's it! No rows of pictures of old guys in Herbert Hoover collars who founded and developed I&T, no photos of ancient linotype machines or the building that was flooded out around the turn of the century. Just stuff about this business that we hope you'll find interesting.

The Farm Equipment Dealer Gets Involved In Lawn-Garden Lines

One of the nice things about working for this magazine is the kindness with which its readers respond to our requests for help. We recently sent out questionnaires to 778 dealers and had got back answers from almost half of them—380—when the tallies were made. This is a remarkable response rate. A 25 per cent response rate would be considered excellent. And so we thank you.

The subject was lawn and garden equipment. Of the respondents, 82 per cent retail such equipment. Of those 311 dealers, 42 per cent sold more such equipment in 1985 than in 1984 and 32 per cent sold about the same amount. About half our respondents did it with the same inventory as the year before.

I don't know what that suggests to you, but to me it indicates that dealers as a group are trying harder on their lawn and garden lines than they did at any time in the past. As for 1986, 35

per cent of the dealers said they will be increasing their inventory while 56 per cent will keep it about the way it was this year. I suspect that if they are going to continue working the lawn-garden beat harder, they'll be achieving a better turnover on their inventory, whether they increase it or not.

Here's the part that really made me pay attention: Those 311 dealers had median total sales of \$1.67 million and a median volume in lawn-garden lines of \$59,000. And about a third of those dealers did over \$100,000. Of the 119 dealers in the study who did over \$2 million in total volume, 28 per cent did from \$100,000 to \$300,000 in lawn-garden sales and 21 per cent did over \$300,000.

One of my first reactions to the study was that there must be some old timers in the lawn and garden equipment business who loathe these farm equipment types with a passion. Now that there's more margin to be earned in a garden tractor than in a big farm unit, here we come eager to sell stuff at which we were turning our noses up a half-decade ago.

It's not just retailers. Shortline manufacturers are turning to consumer products where they see an opening, a chance to use some of the idle plant capacity.

There's some irony in all this. A couple of decades ago, major farm equipment manufacturers moved into what had been the private domain of some small manufacturers of garden tractors. International Harvester put that good old Cub name beside a new one, Cadet, and enjoyed a nice surge. So did Deere & Co., J I Case, Allis-Chalmers and Massey-Ferguson.

One of those small manufacturers admitted in a convention speech back in the sixties that the originals in that business had been given a sound lesson in marketing by the farm equipment

(Continued on page 29)

Inventory Watch

	May	June	July	August	Sept.	October	12-Month Sales, Nov. 1984-Oct. 1985
Tractors							
Under 40 hp	42,416	37,814	38,093	39,808	40,319	41,153	57,088
40-99 hp	30,573	28,024	27,667	27,724	27,686	26,455	38,429
Over 100 hp	25,912	25,219	24,594	24,123	23,487	23,171	18,553
Four-wheel drive	4,361	4,185	4,189	4,057	3,811	3,601	2,773
Total Tractors	103,307	95,242	94,543	95,712	95,303	94,380	116,843
S-P Combines	10,081	10,299	10,064	9,379	8,969	8,353	8,930

Source: Farm & Industrial Equipment Institute

Auction Prices

Asterisk beside price indicates highest bid offered on tractors that were not sold.

YODER & FREY, INC. Archbold, Ohio November 12, 1985

OLIVER TRACTORS

550, 1958 (Fair)	2150*
550, 1965 (Good)	2200
1800 diesel, 1962 (Fair)	2400*
1850 diesel, 1961 (Rough)	2675
1855 diesel, 1972 (Good)	4200*
1855 diesel, 1972 (Good)	4500*
1900 diesel, 1962 (Fair)	2000*
1955 diesel, 1972 (Good)	5300

DEUTZ TRACTORS

DX90 diesel, 1983 (Excellent)	8900
D68-06 4WD, (Good)	8200*

INTERNATIONAL HARVESTER TRACTORS

SH, 1952 (Rough)	675
M, 1944 (Rough)	700*
M, 1947 (Rough)	875*
M, 1950 (Fair)	650
450, 1957 (Rough)	825
454, 1971 (Fair)	5000*
560 diesel, 1960 (Rough)	1600
660, 1958 (Good)	1200*
666 diesel, 1975 (Good)	5200*
766, 1976 (Fair)	5200*
806 diesel, 1965 (Fair)	2800
806 diesel, 1966 (Fair)	5100*
806 diesel, 1965 (Rough)	3125
806, 1965 (Fair)	2600*
856 diesel, 1969 (Fair)	3100*
966, 1975 (Fair)	5300*

1066 diesel, 1974 (Fair)	7800*
1066 diesel, 1974 (Rough)	4300
1066 diesel, 1972 (Fair)	6250
1066 diesel, 1972 (Fair)	5600*
1088 diesel, 1977 (Good)	12,000*
1206 diesel, 1967 (Fair)	3800
1206 diesel, 1965 (Fair)	4600
1256 diesel, 1968 (Fair)	3800*
1466 diesel, 1972 (Fair)	4300*
1466 diesel, 1975 (Fair)	5100
1466 diesel, 1975 (Good)	5200*
1466 diesel, 1979 (Good)	6600
1566 diesel,	8000
1566 diesel, 1974 (Good)	5800
1588 diesel, 1976 (Rough)	6600*
1596 diesel, 1977 (Good)	9750*
3588, 1979 (Good)	10,750*
4386, 1978 (Fair)	9500*

FERGUSON & MASSEY-FERGUSON TRACTORS

TO-20, 1946 (Rough)	900*
TO-20, 1946 (Rough)	975
TO-30, 1951 (Good)	1800
TO-30, 1950 (Rough)	1030
35, 1958 (Fair)	1400
35, 1961 (Fair)	2275
65, 1958 (Rough)	1400
135, 1968 (Fair)	2400
135, 1969 (Fair)	2700
135, 1970 (Rough)	2350*
165 diesel, 1969 (Fair)	3300
165 diesel, 1967 (Good)	3150*
165, 1970 (Rough)	2800*
180, 1966 (Rough)	2500
285 diesel, 1980 (Good)	5750*
1155 diesel, 1962 (Fair)	4300*

1805 diesel, 1975 (Fair)	9400*
--------------------------	-------

STEIGER TRACTOR

Bearcat, Ser. II	10,500
------------------	--------

CASE/DAVID BROWN TRACTOR

830, 1967 (Good)	1950
------------------	------

MASSEY-HARRIS TRACTOR

44, (Rough)	700
-------------	-----

ALLIS-CHALMERS TRACTORS

C, 1947 (Fair)	500*
WD, cult., 1948 (Rough)	900*
WD, plow, 1946 (Rough)	600*
D-15, 1967 (Fair)	1850*
D-17, 1967 (Fair)	2000*
190 diesel, 1963 (Rough)	2500*
190XT, diesel, 1968 (Fair)	3875*
200 diesel, 1971 (Fair)	4400*
7045 diesel, 1979 (Good)	8700*
7060 diesel, 1977 (Good)	7300*
7060 diesel, 1979 (Good)	10,200*

WHITE TRACTORS

2-85 diesel, 1977 (Good)	7100*
2-105 diesel, 1976 (Fair)	6400*
4-150 diesel, 1975 (Fair)	6200*

JOHN DEERE TRACTORS

B, 1947 (Fair)	575*
70 diesel, 1956 (Rough)	710
720, 1957 (Good)	2400
720 diesel, 1965 (Good)	1750
730 diesel, 1959 (Good)	1200*
730, 1960 (Good)	1600*
730 diesel, 1958 (Good)	1750

1010, 1962 (Fair)	2250
3020 diesel, 1970 (Fair)	3750
4010 diesel, 1961 (Rough)	2950
4010, 1963 (Fair)	2450
4010 diesel, 1963 (Fair)	5250*
4020 diesel, 1966 (Good)	5700
4020 diesel, 1965 (Fair)	4000*
4020, 1965 (Good)	4300*
4020 diesel, 1967 (Good)	5700*
4230 diesel, 1975 (Good)	6800
4320 diesel, 1971 (Good)	9100*
4320 diesel, 1972 (Fair)	6750*
4320 diesel, 1971 (Good)	6300*
4430, 4WD, 1977 (Fair)	13,500*
4430 diesel, 1975 (Rough)	9400*
4430 diesel, 1976 (Fair)	11,500*
4820 diesel, 1972 (Good)	6300*
4630 diesel, 1977 (Fair)	11,500*
7520 diesel, 1971 (Rough)	9250*

FORD TRACTORS

BN, 1949 (Good)	1725
BN, 1949 (Good)	1250
BN, 1952 (Good)	1750
BN, 1949 (Fair)	1300
BN, 1949 (Rough)	1100*
9N, 1945 (Rough)	1100
9N, 1946 (Rough)	900
9N, 1944 (Rough)	975
600, 1957 (Good)	2300*
800, 1957 (Fair)	2475
900, 1957 (Rough)	1050
4000, 1970 (Fair)	3400
5000 diesel, 1965 (Rough)	2700*
5000 diesel, 1970 (Fair)	4000
6000 diesel, 1960 (Rough)	650
4400 diesel,	1875

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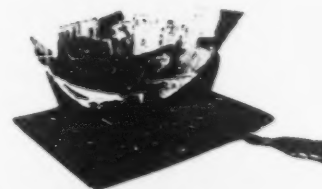
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641, 1957 (Rough)	1900
Jub.	1925
3000, 1972 (Good)	3900
3000 diesel, 1966 (Fair)	3200*

**JONES FARM
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Dothan, Alabama
November 12, 1985**

CASE TRACTOR

2670 diesel, 1975 (Fair)	5650
--------------------------	------

FORD TRACTORS

6800 diesel, 1977 (Good)	9500*
6000 diesel, 1967 (Rough)	1700
5000 diesel, (Fair)	3850
5000 diesel, 1965 (Fair)	2400
4800 diesel, 1976 (Good)	3600
4800 diesel, cab, 1976 (Fair)	2900
4000 diesel, 1975 (Good)	4400
4000 diesel, 1970 (Good)	2500
4000 diesel, 1965 (Good)	3400
4000 diesel, 1964 (Rough)	1800
4000 diesel, 1962 (Good)	3750
3000 diesel, 1966 (Fair)	2950*

3000 diesel, (Good)	2925
3000 diesel, (Good)	2750
2610 diesel, 1981 (Good)	7000*
2110 diesel, 1983 (Good)	6000
2000 diesel, 1989 (Good)	3925
2000 diesel, 1988 (Fair)	2650*
2000 diesel, 1987 (Fair)	2550
2000 diesel, 1986 (Fair)	2700*
2000 diesel, 1982 (Fair)	2000*
641, 1957 (Fair)	1425*
640, 1954 (Fair)	1600
600, (Fair)	1500*
Dexta, 1963 (Fair)	1650
8N, 1951, (Fair)	1275
8N, 1947, (Fair)	1450
8N, (Fair)	1175*
8N, (Fair)	1100*

**INTERNATIONAL HARVESTER
TRACTORS**

826 diesel, 1970 (Fair)	2650
784 diesel, cab, (Good)	5250
674, 1974 (Fair)	2250
574 diesel, 1977 (Good)	3350*
574 diesel, cab, 1976 (Good)	4300
574 diesel, cab, 1976 (Good)	4000*
574 diesel, cab, 1973 (Good)	3800*
574 diesel, 1972 (Good)	3300
504, (Fair)	1075*
454 diesel, 1972 (Good)	3250
454 diesel, cab 1971 (Good)	3800*

444 diesel, 1970 (Good)	3100*
424 diesel, 1965 (Fair)	1450*
414 (Rough)	600
414 (Fair)	1700*
B414 (Rough)	1150
B275, (Rough)	950
C, (Rough)	425
Cub., (Fair)	1700

JOHN DEERE TRACTORS

4240 diesel, cab, 1979 (Good)	10,750
2240 diesel (Good)	4500
4230 diesel, 1974 (Good)	5600*
4030 diesel, 1974 (Good)	5600*
2130 diesel, cab, 1977 (Good)	5000
2130 diesel, 1975 (Good)	2900*
2130 diesel, 1974 (Good)	5500
2020 diesel, 1967 (Good)	3650
2010 diesel, 1962 (Fair)	900*
1520,	3600
1120 diesel, 1976 (Good)	3800
420, 1958 (Fair)	1625

KUBOTA TRACTORS

L225 diesel, (Rough)	900
B6100 diesel, (Good)	1750
B6100 diesel, (Good)	1750
L225, (Good)	1700*

LONG TRACTOR

560, diesel (Fair)	1050
--------------------	------

MASSEY-FERGUSON TRACTORS

2705 diesel, 1979 (Good)	10,000
5/5 diesel, cab, 1976 (Fair)	2500*
282 diesel, 1981 (Excellent)	7700*
275 diesel, 1975 (Fair)	4500
265 diesel, (Fair)	3650
235 diesel, 1975 (Good)	4050
175 diesel, 1972 (Good)	3700
175 diesel, 1972 (Fair)	3800*
175 diesel, (Rough)	1650*
165 diesel, 1974 (Good)	3000
165 diesel, 1969 (Good)	3125
165 diesel, 1968 (Fair)	1800
165 diesel, 1966 (Fair)	2850
135 diesel, 1972 (Fair)	2800
135 diesel, 1972 (Fair)	2800
135 diesel, 1971 (Good)	2450
135, 1969 (Fair)	2700
135, (Fair)	3000
50, (Fair)	1800
35, diesel, 1963 (Fair)	1800
30, (Rough)	800
TO30, 1949 (Fair)	1300
TO30, (Fair)	1300
TO20, (Fair)	1275

MASSEY-HARRIS TRACTOR

50, 1956 (Good)	2000
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OLIVER TRACTOR

D, (Rough)	1050
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NOTES:

Prices reported are for individual sales at wholesale on an "as is," "cash and carry" basis. Prices reported are not averages.

Condition Classifications:

EXCELLENT: Engine in perfect condition, 400 to 600 hours of use. Rubber—80% tread remaining, no breaks or cracks. Paint—original and bright. General appearance: excellent.

GOOD: Engine in good running condition. Rubber—70% tread remaining, no

breaks or cracks. Paint—original or a good repaint job. General appearance: good over-all.

FAIR: Engine possibly in need of a minor overhaul. Rubber—60% tread remaining, some cracking evident in sidewalls. Paint—only fair, weathered and some rust apparent. General appearance: worn, some dents, minor parts (gage covers, etc.) missing or broken.

ROUGH: Engine obviously in need of a major overhaul. Rubber—smooth. Paint—scarred, weathered, rusty. General appearance: dents, ruptures, broken parts, loose wires, components (such as lights) broken, missing or inoperative.



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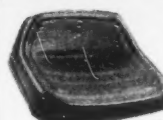
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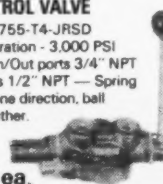
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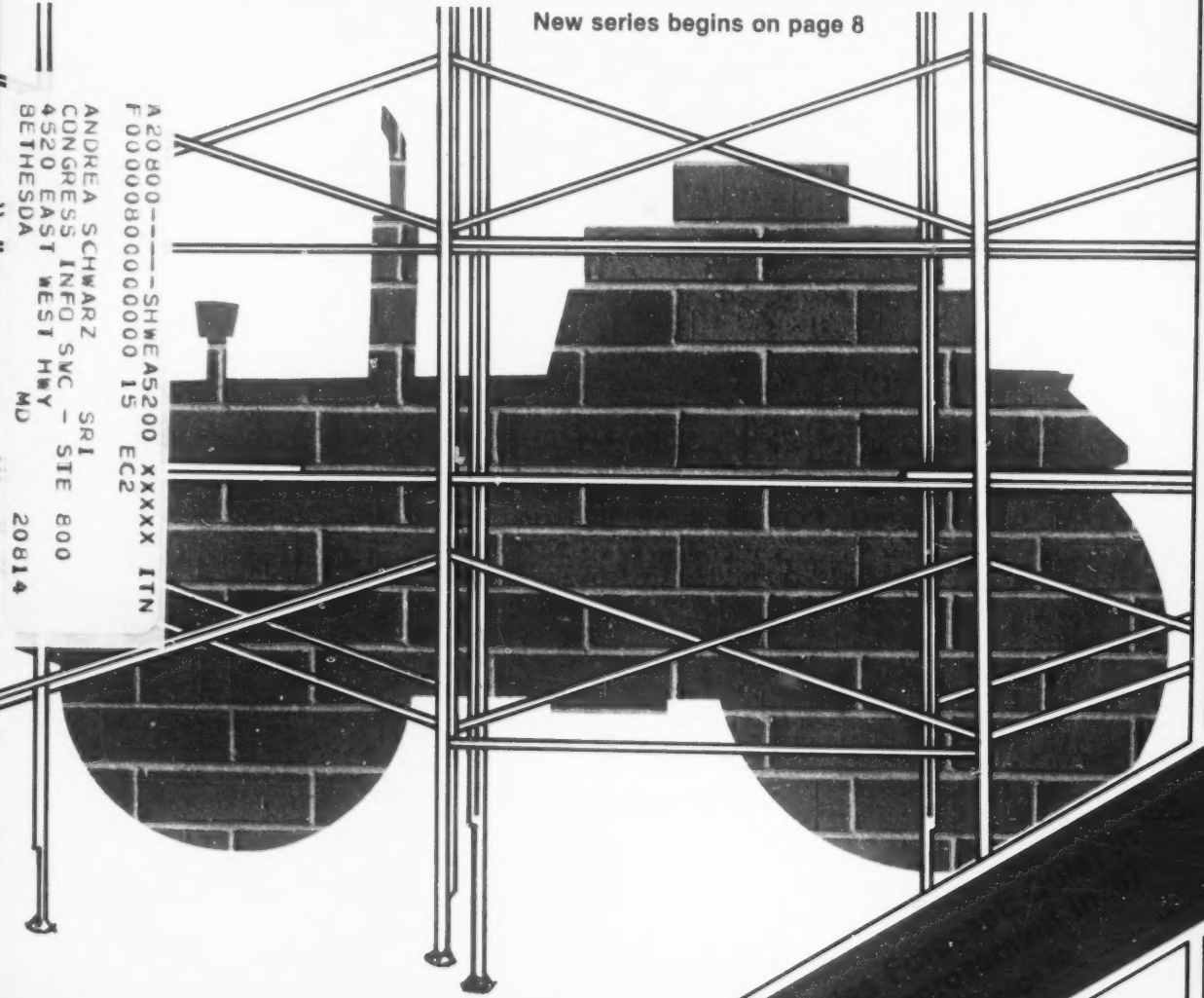
FEBRUARY 1986

U.K.'s Smithfield: Awaiting the Japanese page 16

Reconstructing the industry

New series begins on page 8

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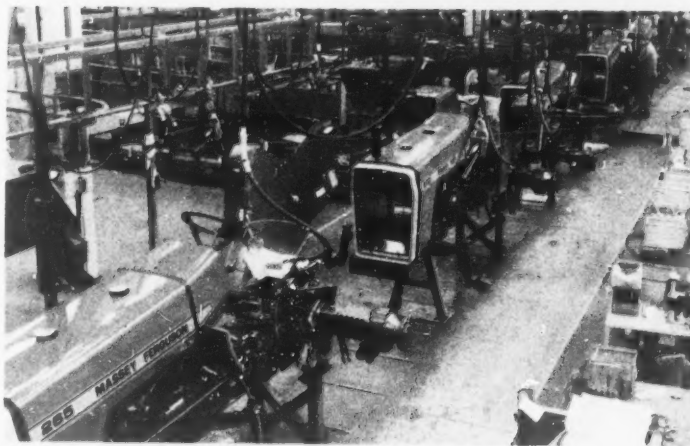
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Implement & Tractor

The business magazine of the farm and industrial equipment industry.

February 1986 • Vol. 101 • No. 3



page 8

- 8: How Massey Changed Itself.** Part 1 of a series on Reconstructing the Industry looks at the extreme measures Massey-Ferguson took to survive, even before the big market crunch. What has emerged is an M-F that is highly flexible and apparently headed for sustained profitability.
- 16: British Await New Japanese Competition.** A report from the Smithfield machinery show finds Iseki and Kubota gearing up for the U.K. market, despite sluggish ag business in recent months.
- 20: Ceramic Materials for Farm Equipment.** The search for greater wear resistance than iron and steel in ground-engaging applications has led, in Britain, to some commercial breakthroughs for ceramics.
- 24: Forecast: Quiet 1986, Better in 1987.** The FIEI again gathers projections for the upcoming market year and the general outlook is for more of the same.
- 26: Farm Equipment Shipments.** At last available, having missed the traditional November statistical issue last year, are the figures for quantities of farm machines shipped 1980-1984, along with dollar values of major sales categories.

DEPARTMENTS

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Closing Out 1985 Retail Sales: Thank Heaven for Little Tractors

The last 1985 flash report from the Farm & Industrial Equipment Institute shows on-

ly one product category in U.S. retail sales with an increase and another finishing about even

with 1984. All other products showed unit sales declines of 14 to 30 per cent.

	Unit Retail Sales					
	December		Pct.	January-December		Pct.
	1985	1984	Change	1985	1984	Change
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	3,435	3,321	+ 3.4	57,203	51,010	+12.1
40-99 hp	2,575	2,760	- 6.7	37,837	38,252	- 1.1
100-139 hp	496	738	-32.8	7,299	9,843	-25.8
Over 140 hp	757	901	-16.0	10,410	14,653	-29.0
Total 2-wheel drive	7,263	7,720	- 5.9	112,749	113,758	- .9
4-wheel drive						
Under 200 hp	258	178	+44.9	1,088	1,533	-29.0
Over 200 hp	279	224	+24.6	1,824	2,442	-25.3
Total 4-wheel drive	537	402	+33.6	2,912	3,975	-26.7
Total All Tractors	7,800	8,122	- 4.0	115,661	117,733	- 1.8
S-P Combines	919	883	+ 4.1	8,402	11,420	-26.4
Balers (under 200-lb. bales)	239	205	+16.6	7,040	8,313	-15.3
Forage Harvesters						
(shear-bar type)	114	156	-26.9	2,462	3,538	-30.4
Mower-Conditioners	409	343	+19.2	11,245	13,057	-13.9

Canadian Numbers Look Better

Retail sales of farm equipment in Canada finished 1985 in a relatively better position

than those of the U.S., according to the Canadian Farm & Industrial Equipment Institute.

	1985	1984	Pct. Change
Farm Tractors			
2-WD under 40 hp	3,943	3,449	+14.3
2-WD 40-99 hp	8,474	8,521	-0.6
2-WD 100 hp +	4,854	5,099	-4.8
Total 2-WD	17,271	17,069	+1.2
Total 4-WD	2,524	2,519	+0.2
Total Tractors	19,795	19,588	+1.1
Mower-Conditioners	2,174	2,195	-1.0
Balers (conventional)	1,694	1,879	-9.8
Balers (round)	2,545	1,986	+28.1
Forage Harvesters	490	598	-18.1
Combines (pull-type)	1,241	914	+35.8
Combines (self-prop.)	2,838	2,710	+4.7
Swathers (pull-type)	2,371	2,214	+7.1
Swathers (self-prop.)	2,072	2,020	+2.6

Deutz-Allis Fusing Complete

As promised at a series of dealer meetings last June, the merging of Allis-Chalmers Agricultural Equipment Co. and Deutz Farm Equipment into Deutz-Allis Corp. was completed as of Jan. 1.

Ray Dague, marketing vice-president of Deutz-Allis, has announced that Ormand

Scholl is vice-president, market development; Jim Peterson is general sales manager, east, based in Columbus, Ohio; and Ed Swingle is general sales manager, west, at Independence, Mo.

Scholl had been executive vice-president of Deutz Corp. in Atlanta; Peterson had been

general sales manager for Deutz Farm Equipment; Swingle moves from the post now held by Peterson.

Earlier, Frank Kaplan, Deutz director of marketing, was named Deutz-Allis's manager of marketing, tractors, implements and hay tools.

According to Deutz-Allis, the merged organization now has 1,465 dealers, including 77 newly signed outlets.

Parts operations are consolidated with seven regional distribution centers and two central operations at Batavia, Ill., and Independence. Customer service and order entry functions are based in Batavia.

In mid-January, D-A launched a series of training sessions to familiarize dealers' service personnel with products in the newly merged line. The company says the program will provide over 30,000 hours of individual training.

Production of the orange tractor line at West Allis, Wis., was concluded in early December. Subsequently, all tractor production will be done in Cologne, West Germany, base of the parent company, KHD.

Briefly...

Lindsay Bros., Minneapolis, Minn., one of the major wholesalers of the farm equipment industry, has been purchased by C.O.M.B. Co., Plymouth, Minn. Hugh Lindsay, president, has retired. The Lindsay branch in Omaha, Neb., was closed Jan. 31; another branch at Mason City, Ia., was closed last year.

Allied Products Corp., Chicago, Ill., has signed a letter of intent whereby it will buy Lilliston Corp., Albany, Ga. The deal is expected to be closed approximately at the end of March.

Farmhand, Inc., Excelsior, Minn., and the Tye Co., Lockney, Tex., have entered into a marketing agreement by which Farmhand will market Tye grain drills and no-till seeding equipment in Minnesota, Iowa, the Dakotas, Nebraska, Colorado, Montana and Wyoming. The Tye line had been represented in those states by Lindsay Bros., Minneapolis.

Farm Plan Goes National

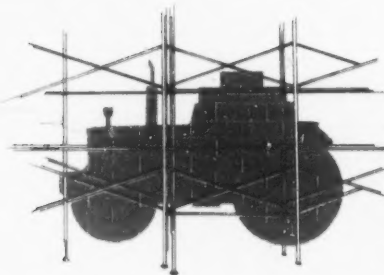
Farm Plan Corp., Madison, Wis., has announced that it is making its credit services available throughout the 48 contiguous states. Until Feb. 1, it was available in 22 states to farm equipment dealers and other rural merchants.

Previously, Farm Plan operated through local and regional banks, which purchased dealers' existing accounts receivables and assumed financing and credit administration responsibilities.

As of Feb. 1, Farm Plan Corp. assumed financing and credit administration responsibilities in new markets. Farm Plan will assume liability for transactions by Farm Plan-approved customers.

According to Ron Carne, president and founding partner of Farm Plan, "Customers can continue buying items at local merchants on credit while merchants are relieved of heavy credit burdens."

In 1984, Deere & Co. acquired Farm Plan, then operating as Association Credit Plan, Inc. It now operates as an independent financial subsidiary.



Reconstructing the Industry

It's time to take a wide-angle view of some of the key changes that just a few years have wrought in this industry we call farm and industrial equipment. We're calling this series "Reconstructing the Industry" because all the radical changes, consolidations, shifts and disappearances we've seen so far, and can expect to see more of, are more than adjustments. They are a re-scaling of the production, marketing, financing and servicing aspects of this business to fit the present and anticipated future need of our customers. And that's reconstruction.

The series opens here with a look at one major manufacturer and some of its biggest and most meaningful changes. Coming in the March issue of I&T: Scott Nesbitt takes a look at one of the merged majors.

Part I:

HOW MASSEY HAS CHANGED ITSELF

Massey-Ferguson Ltd. had to take extreme measures to survive, even before the big crunch came. What has emerged is a highly flexible company that appears headed for sustained profitability.

By Bill Fogarty

■ **PEOPLE** at Massey-Ferguson make a point of explaining that when the rest of the farm and industrial equipment industry was still riding high in the late 1970s, they were already in trouble—and that this may have been their salvation.

It's hard to argue with the numbers. MF had been running hell-bent for supergrowth through the 1970s, just like everybody else. Worldwide, they kicked the volume up from \$1.8 billion in 1974 to \$2.9 billion in 1977 and \$3.1 billion in 1980.

But net income figures were marching to a different drummer. MF had a profit of \$100 million in 1975 and another of \$108 million in 1976. Then, after profits dipped

sharply in 1977 to \$32 million, there was a \$262 million loss in 1978. And that loss was not to be the worst, for in 1982, the red ink ran to \$413 million.

How Massey-Ferguson got into so much trouble before anybody else in the business could probably fill a textbook. Victor Rice, who is MF's chairman and chief executive officer, paints this portrait:

"Those (the 1960s and 1970s) were giddy times. We sold everything we could make for top dollar, tossed up factories to make more, and paid for it all with borrowed dollars that we could pay down with ever-cheaper dollars. Like the energy business, agriculture and agribusiness really feasted on inflation....

Hindsight tells us that we were indulging in leapfrog with a dangerous playmate.

"Growth for growth's sake, when funded by inflation's funny money, is seductive. You sit back and enjoy it, forgetting that there is no free lunch. In the farm machinery business, we forgot, and we are still paying the piper."

But Massey-Ferguson managed to get into trouble deeper and sooner than the rest of the players in the industry. In I&T's opinion, it was a matter of the company trying to do too many things too soon, wanting to move into the same block in North America with Deere and International Harvester. In 1965, they set up their North American headquarters in Des Moines because, they said, they felt they had to become a major factor in the Corn Belt. That didn't happen, at least to their expectations.

True international?

If MF never felt as strong as it wanted to be in the U.S., it prided itself over the years as being one of the world's true international companies. From 65 to 70 per cent of its sales volume came from outside North America. The company at its peak was doing business in 190 countries; counting associates and licensees, it was making products in 81 factories in 31 countries. How could it be considered anything but an international?

But when the business turned sour and it was time for basic corporate soul-searching, the company's young management came to understand that they were international only in a limited sense.

Reporting to headquarters in Toronto was a collection of operating units based in France, Britain, Argentina, the U.S., Italy and elsewhere. Each unit pretty much went its own way when it came to production facilities, product lines, engineering and marketing.

"The only common denominators in MF tractors around the world," says John Ruth, "were the model numbers and the engines." Ruth is North American sales manager for the company's Tractors & Farm Equipment Div., which didn't exist

in its present form a few years ago.

"Each operating unit was reporting to the corporate staff, but each was also operating as if it were a fiefdom or barony, very protective of the way it operated within its own country."

Another recognition: The changes that were getting under way in world agricultural markets were not just cyclical downturns but permanent alterations. Massey-Ferguson would have to adjust itself not only to survive the downturn that has now persisted through the 1980s, it would also have to become a company sized down to the point of making a profit in a market that was going to stay depressed for a long time, and never resume its former grandeur.

Self-definition

Massey-Ferguson also had to do what any company confronting the fundamentals of its future must do—get a fix on what business it was in. That's an expression that has suddenly become a cliché in business parlance, but it's an exercise that most companies in any industry must undertake at some point.

For MF, the core business was defined as agricultural and light industrial machinery and diesel engines.

(More...)



Victor A. Rice, MF chairman, credited with being the primary architect of Massey-Ferguson's present structure and with getting a large number of banks, and some governments, to stick with the company through difficult times. "Talking with bankers," he said recently, "has become by avocation. When I became chairman (in 1980), I never expected to develop a close relationship with an intimate circle of 220 bankers....The bankers I deal with understand that we're all in the same boat; they know that the merry-go-round of piling up debt and paying it down in ever-cheaper dollars has rumbled to a dead stop...."



At the Coventry (U.K.) tractor plant, now the source of most MF tractors sold in the U.S., automated guidance vehicles have collected the parts needed for a major component from a subassembly area. The AGVs now act as mobile work stations for lifters on the line.

Massey Changes

(continued)

And so in 1979, the company disposed of its construction machinery product line and plants. Consumer products—lawn and garden equipment and snow-mobiles—were also disposed of as were other enterprises such as an office furniture business.

When a company has 81 factories, it isn't surprising that all its activities come to focus around the idea of keeping them busy. When business was good, it wasn't hard to do this and make money, but eventually, MF's self-analysis showed that it was a manufacturing-driven organization, also driven by debt.

The idea became to turn the business into a marketing-driven company—to manufacture only what it could sell.

Talking to a group of bankers about the changes his company has gone through, Victor Rice recently commented:

"We understand that we must be market-driven, as in contrast to the old debt-driven days. Notice I said market-driven, not profit-driven. If your business strategy is profit-driven, you don't belong in the farm and industrial equipment industry. You're an investor, not a business manager. When you are propelled

by market values, you must run your business primarily to satisfy your customers, not your lenders or your investors."

He added: "Disinflation puts a premium on marketing skills. Without the incentive of rising prices to cover rising costs, you scramble for every possible edge in the marketplace. You focus on things like product differentiation, quality control, productivity in factory and office alike, improvements in distribution and customer service in the aftermarket—anything and everything that can set you apart from the crowd."

Rice said that in such a climate of motivation, only fast-return capital investments are made, that internal cash flow, not external debt, becomes the focus of financial strategy.

"You find yourself taking extraordinary measures to control inventories and use labor effectively. You devote time to pricing strategy and you demand the most value for money from suppliers."

Divisional structure

That explains a lot of the look that Massey-Ferguson has today. Once the decision was made to produce only what it could sell profitably, Massey-Ferguson went about taking the difficult but necessary actions—shutting down factories permanently, making drastic reductions in the number of employees, cutting costs, doing everything possible to lower the breakeven point. These were steps like those any other farm equipment company has had to make.

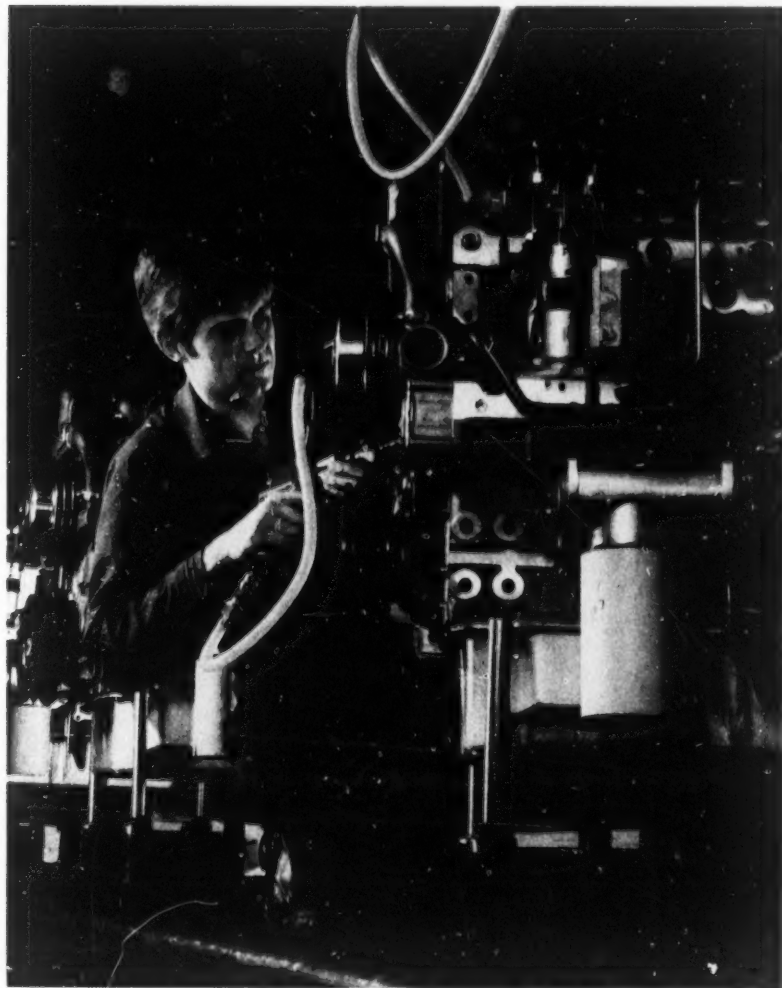
The move that was substantially different was the restructuring of MF. The 31 nationally-oriented operating units were reformed into eight product-based, worldwide divisions.

The eight divisions:

Tractors and Farm Equipment Div.—Agricultural tractor manufacturing (models from 30-150 hp), as well as tractors under 30 hp and implements sourced from contract suppliers. Tractors are made in Britain, France and Italy.

Combines & Related Equipment Div.—Combines, headers, four-wheel-drive tractors, and balers,

(More...)



Perkins Engines, claiming 11 per cent of the Western world's market for non-automotive diesels from 30-300 hp, did \$314 million in sales in 1984 (not counting the \$86 million in sales to the parent MF). With a total capacity of 620,000 units, Perkins and its associates and licensees made 253,000 engines. Of these, 129,000 were produced at Perkins plants in the U.K. Last year, Perkins celebrated production of its 10 millionth unit.

Telemarketing, Teleservice to Cut Costs, Provide Needed Dealer Help



Bob Gertner, MF service specialist, talks with a dealer's service technician about a repair problem, refers to a manual for the information.



Terry Dickie calls up warranty data on a specific machine. Teleservice specialists were recruited from field service reps' ranks; other service personnel were retrained as product specialists, still do some in-field service work.

In the early 1980s, Massey-Ferguson's North American marketing organization decided that the traditional structure for reaching a market through a dealer organization had major drawbacks. Something had to be done, they felt, about the cost of servicing small dealerships.

Below a certain volume level, their research showed, MF dealers had an average inventory turn ratio of about 0.3 times per year. It might have been possible to cancel out those dealers, or many of them, and turn their trade areas over to larger retailers.

Instead, MF instituted a system of telemarketing and teleservice for these dealers. In the normal course of business, they wouldn't be visited by the blockman or the service rep, as has been the tradition in this business for generations. But they were given immediate access to a contact person at North American headquarters in Des Moines who functioned as a blockman, or a service rep trained to provide information necessary on service problems.

According to John Ruth, head of Tractor Div. sales in North America: "At the end of two years, telemarketing dealer sales were up. Assets necessary to support those sales were down 47 per cent. Inventory turnover among these dealers went from an average of once every three years to once a year. By this time, we were handling 4,000 calls a month—200 a day."

The teleservice program topped MF expectations, according to Ruth. "We were surprised to learn that 90 to 95 per cent of all tractor repair problems could be handled by phone almost immediately. For the others, a field service rep was scheduled into the dealership."

Being put on telemarketing and teleservice caused some MF dealers to drop out, which company executives had anticipated. It also caused some dealers to raise their order levels enough to qualify them for a live district sales rep and service rep., as had been expected.

What wasn't anticipated was that dealers with enough volume for in-person calls wanted access to telemarketing and teleservice support, too. They got it.

Massey now has 16 telemarketing district sales managers and six service specialists taking calls from the complete North American dealer organization.

Says Graeme Leonard, head of the Tractor Div. product support organization, other service supervisors in the organization were turned into product specialists. "They spend about 60 per cent of their time in teaching dealers how to demonstrate the product and another 20 per cent on service training of dealership service technicians. Most of the rest of the time is spent taking care of the service problems that require a visit to the dealership."

Leonard says that the teleservice specialists get about 350 calls a week, and have gotten up to 550 in a week. About 70 per cent of the calls concern a service problem; 15 per cent are about parts (if the dealer needs a part, he's transferred to parts); 7 per cent are about products; warranty and related policy matters take up 5 per cent.

"Most of the calls are from dealerships or our own people," he said. "Customers make about 5 per cent of the calls, and we try to get them together with the dealer in a three-way conversation."

One of the problems, Leonard admits, is getting the six service specialists off the phone long enough for more training. "Every other month, the specialists go to the field and meet with dealers and customers in their areas."

Notes Howard Lyndon, general product service manager, "The calls themselves provide an upgrading in product and service knowledge for the six specialists. And they never quit on seeking to improve themselves. Typically, they'll spend their lunch time watching films on things like engine failure analysis or clutch rebuilding."

Massey Changes

(continued)

mostly for North America. Combines for Europe are sourced from other suppliers. Production is in Brantford and Toronto, Ont.

Canadian Foundries Div.—Production of gray iron and nodular castings.

Engines Div.—Production of 30 to 1,200-horsepower Perkins diesel engines, primarily in the United Kingdom with finishing, assembly and remanufacturing in France, Australia and the United States.

Industrial Machinery Div.—Industrial wheeled tractors and backhoe-loaders, off-highway materials-handling machines. Production and headquarters at Manchester, England.

Components Div.—Production of hydraulic cylinders, valves and related equipment, based at Eschwege, West Germany.

Australia Div.—The only national operating unit remaining, it manufactures combines and implements for the Australian market.

Trade & Barter Div.—This unit engages in product-for-product transactions, focusing on Third World markets where currency reserves are limited. Offices are in London and New York.

Each of these divisions, except for Australia, has been given a global marketing charter. That is, it is responsible for selling its own products all over the world.

Marketing differences

This means, for example, that a Massey-Ferguson dealer in the U.S. who handles the company's entire range of farm tractors, implements and combines and also carries the industrial equipment line would have several separate MF contracts.

It's also possible that a visitor could come into a town and find the MF sign in three separate locations—a dealer handling farm tractors and implements, another handling combines (and possibly four-wheelers) and a third covering the industrial market.

Such a situation might cause some diffusion of identity, but it makes some other things possible. In the past, some manufacturers, MF among them, have appointed dealers for a given area only to learn

that one segment of the product line—perhaps combines, perhaps tractors—was to get the effort, to the neglect of the rest of it. It's called "cherry picking" by many sales managers.

The structure MF has adopted allows each division to focus on its product specialty and go after its markets without what might be encumbrances. Dealers may like to deal with one company, one division, one blockman and one service rep, but many of them have done fine for many years using multiple suppliers.

In effect, Massey-Ferguson has become a collection of shortline companies while the mergers of the past 15 months have established or extended other companies as full-line producers.

MF is sourcing most of the implements it sells around the world from other manufacturers. The combines it sells in Europe are made by a Danish company. Plows for Africa are from a Turkish factory.

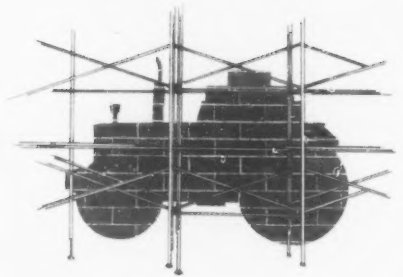
James Felker, who heads MF's Tractors & Implements Div., was asked not long ago how he reacts to the statement that apart from the tractors, his is largely a distributive organization. "It makes me happy," he said. "We're glad we're sourcing and selling these products at a profit, not manufacturing them."

Restructuring work

Massey has not managed to move through this transition without spending a lot of time with banks and governments. Since 1981, the company has engaged in two major financial restructuring programs involving more than 200 banks around the world.

And in December, MF announced another plan. The Combines and Foundries divisions would be recapitalized as a privately held associate company in which Massey-Ferguson would be a minority (40 per cent) shareholder. Lenders and other parties (presumably including the governments of Canada and Ontario) would hold the rest.

As of this writing, the plan is under consideration. If accepted by shareholders of Massey-Ferguson, the resulting company would be



Massey Combines Corp., with assets of \$350 million and debts and other obligations of \$240 million.

The starting date of the company would be retroactive to Oct. 31, 1985. Losses sustained by the present Combine Div., "particularly in the final months of fiscal 1985 (ended Jan. 31), would be funded through the new entity's reorganized capital structure," said Victor Rice.

In the first nine months of 1985 (through Oct. 31), the Combines Div. lost \$35 million while the rest of the company would have posted earnings of about \$36 million.

In other words, if MF can reduce its crushing losses in the combine business substantially (40 per cent ownership of a business with serious losses is better than 100 per cent), opportunities for doing more with its Tractors and Farm Equipment Div. should be substantial.

Tractor outlook

Massey-Ferguson's tractor marketers estimate that the world tractor market (outside the socialist bloc nations) has fallen by 25 per cent in the past decade—from 808,000 units in 1975 to 608,000 last year.

The market will be up slightly by 1990 to 625,000 tractors and down again by the end of the century to 583,000. Tractor demand in the major developed markets will generally move downward through the next 15 years, according to MF, thus:

Year	North America	
	Europe	North America
1985	250,000	138,000
1990	238,000	138,000
2000	205,000	118,000

But in the developing world—Latin America, Africa and Asia—they expect demand to move

(Continued on page 34)

FORECAST: QUIET 1986, BETTER IN 1987

By Bill Fogarty

■NOT MUCH change in the coming year from 1985. That's how the consensus forecast of the Farm & Industrial Equipment Institute's Marketing & Management Conference can be summed up. But then that's how they predicted 1985 would go, and where it went, for the most part, was down.

The sales forecast is made two times a year. Participating executives from FIEI member companies predict the increase or decrease, if any, in unit sales of major industry products. Their forecasts are collated and the numbers that turn up on the table are medians expressed as units sold at retail.

It hasn't been easy for industry

marketers. The leveling out and improving that they have been anticipating for several years hasn't materialized, except for the interesting variants in the areas of medium and small tractors.

For 1986, marketing people in the Farm Equipment Div. of FIEI (field equipment) have considerably diverging views on the total sales outlook, as expressed in terms of retail dollars. Among 50 participants, 16 see no change in sales volume; seven see increases ranging from two to 13 per cent; and the remaining 27 anticipate declines of from one to 11 per cent. That works out to a median of about two or three per cent down from 1985.

The Agri-Equipment Div. (farm-

stead and related equipment) executives don't see it quite the same way for their segment of the industry. The 28 participants had a range of expectations from a 25 per cent increase in retail dollar volume to a decrease of 15 per cent. Ten expect sales to go up, nine see no change and nine look for a decline. The median: No change.

The bright spot

The industry sold 51,000 tractors of under 40 pto horsepower in 1984. When 1985 was getting started, the companies that sell models in this range were not expecting to do as well—50,000 units. They stuck by their consensus forecast last spring

(Continued on page 32)

U.S. RETAIL SALES FORECAST, 1986, 1987 (In units)

Product	Actual	Actual	Sales Forecast for	
	Sales, 1984	Sales, 1985	1986	1987
Farm Tractors				
Under 40 HP	51,010	57,000E	57,400	58,500
40-99 HP	38,253	38,250E	38,000	38,000
100 HP and over	24,495	18,028E	17,000	17,000
4-wheel drive	3,975	2,600E	2,550	2,775
Total Farm Tractors	117,733	115,870	114,950	116,275
S-P Combines	11,422	8,200E	8,000	8,250
Corn Heads	6,419	4,900E	4,431	4,775
Forage Harvesters ¹	3,538	2,500E	2,400	2,500
Balers, square ²	8,314	7,000E	6,900	7,200
Balers, round ³	11,170	9,500E	9,500	9,950
Windrowers	2,591	2,000E	1,925	2,075
Mower-Conditioners	13,057	11,100E	10,987	11,300
Grinder-Mixers	2,349	1,750E	1,700	1,600

E: Estimated. 1: Shear-bar type. 2: Sales under 200 lbs. 3: Sales over 200 lbs.
Source: Farm & Industrial Equipment Institute

Value of Shipments, 1980-1984

Tractors, Farm Machinery and Garden Equipment

Including Attachments and Parts

(In thousands of dollars)

	1984	1983	1982	1981	1980
Wheel Tractors, Farm Type	2,074,529	1,720,680	2,215,466	3,066,418	2,761,480
Wheel Tractors, Non-Farm	97,031	89,508	80,404	97,257	115,154
Attachments for Wheel Tractors, Farm and Non-Farm	7,545	10,350	24,037	44,965	48,066
Parts for Wheel Tractors, Farm and Non-Farm	228,681	193,702	246,970	421,320	469,505
Wheel Tractor Chassis, Shipped as Part of Shovel Loader/Backhoe	427,047	396,454	234,388	315,639	306,736
SUBTOTAL	2,834,833	2,410,694	2,801,265	3,945,599	3,700,941
Planting, Seeding and Fertilizing Machinery	608,020	447,490	673,080	802,378	680,743
Harrows, Rollers, Pulverizers, Stalk Cutters	376,947	340,951	360,522	552,491	555,377
Plows	151,914	129,746	151,887	233,199	245,875
Harvesting Machinery	1,424,120	1,478,807	2,069,585	2,579,889	2,207,075
Haying Machinery	610,874	541,899	545,099	711,748	778,199
Farm Dairy Machines and Equipment	99,651	116,133	110,656	159,961	143,372
Sprayers and Dusters	251,792	228,465	257,882	248,491	254,083
Farm Elevators and Blowers	69,862	72,578	112,436	117,986	140,809
Cultivators and Weeders	173,260	132,889	202,153	235,994	275,793
Machines for Preparing Crops for Market or Use	191,446	194,556	282,420	319,425	340,083
Farm Poultry Equipment	116,230	102,443	110,409	144,939	174,931
Hog Equipment	41,104	50,490	41,946	41,530	63,951
Other Barn and Barnyard Equipment	174,530	184,566	202,249	257,298	274,220
Farm Wagons, Other Farm Transportation Equipment	132,718	140,300	172,989	212,087	207,105
Irrigation Systems	366,972	330,675	241,395	349,237	308,974
Commercial Turf, Mowing Equipment	270,728	227,531	199,246	191,147	200,666
Other Turf, Grounds Care Equipment	50,928	35,641	38,543	40,743	35,430
Consumer Nonriding Lawn, Garden, Snow Equipment	1,531,129	1,376,463	1,283,718	1,167,768	1,374,557
Consumer Riding Lawn, Garden, Snow Equipment	1,365,402	1,102,952	964,550	899,576	953,403
SUBTOTALS	8,057,627	7,230,573	8,020,765	9,265,887	9,215,006
GRAND TOTAL	10,982,460	9,641,267	10,882,030	13,211,486	12,915,947

Source: U.S. Commerce Dept. Current Industrial Reports: Tractors (M35S) and Lawn and Garden Equipment (MA-35A).

Shipments of Farm Machines and Equipment

(In units, 1980-1984)

Type of Farm Equipment	1984	1983	1982	1981	1980
Balers, hay (all types):					
Bales under 200 lbs.	10,106	6,681	10,130	15,936	17,065
Bales over 200 lbs.	14,701	18,337	14,302	23,213	32,446
Blowers (includes forage type, combination grain-forage type)	3,939	3,825	3,674	6,771	9,752
Cabs (metal), farm tractor	8,397	12,757	19,674	10,597	10,565
Cabs, other equipment	580	671	4,739	6,269	4,051
Combines, grain, pull-type and self-propelled	11,296	13,673	22,726	32,062	28,502
Corn heads	4,388	4,121	7,228	17,107	14,601
Cultivators, corn and cotton types	9,419	8,510	14,622	25,957	28,726
Cultivators, field:					
Pull-type	6,655	4,921	6,493	9,385	14,897
Mounted	2,740	2,252	2,024	3,044	5,257
Cultivators, rotary:					
Ground driven, sections and machines	5,028	5,041	9,986	15,025	20,55
Ground driven, integrally mounted				456	486
Power driven					
Cultivators and weeders, other	17,040	17,519	24,347	30,936	47,727
Cutters and shredders or rotary mowers (pto):					
Flail-type	19,786	17,499	11,451	9,541	12,149
Horizontal blade-type	94,452	88,520	68,433	66,944	75,677
Diggers, peanut (shakers and windrowers but not combines)	1,145	1,055	974	685	1,233
Combines, peanut				270	880
Distributors (fertilizer):					
Dry	8,205	7,159	7,157	6,129	6,254
Liquid	7,581	6,105	5,952	8,841	10,070
Anhydrous Ammonia	2,359	1,697	3,104	6,094	6,693

(More...)

Type of Farm Equipment	1984	1983	1982	1981	1980
Dryers, grain, hay and seed batch type, pto or electric-motor operated	1,858	1,310	4,347	5,413	7,899
Continuous flow-type	942	452	835	1,348	1,419
Heated air units	7,198	7,361	22,178	12,553	14,983
Dusters, power, all types	134	98	493	859	794
Elevators, portable:					
Single chain	3,057	2,721	3,307	5,507	7,316
Double chain	1,796	2,218	2,998	3,074	6,680
Auger-type, under 6-in. dia.	11,0193	10,255	13,874	17,607	25,725
Auger-type, 6-in. dia.	6,351	6,191	7,891	8,373	27,885
Auger-type, over 6-in. dia.	9,928	10,463	18,354	17,537	23,809
Elevators, stationary and other	36,229	32,762	97,680	89,034	33,268
Fans, crop drying and aeration	9,851	16,979	37,263	27,452	26,162
Grain drills, fixed-frame, all types	12,782	10,043	17,331	21,861	19,448
Grain heads for combines	14,151	14,699	24,656	48,656	46,162
Grinder-mixers, stationary and portable	2,907	4,987	4,653	8,031	14,152
Harrows, disk	25,330	23,157	27,448	51,839	67,676
Harrow sections (spike-, spring-, tine-tooth and power)	42,482	42,202	59,404	75,246	96,893
Harvesters, beet	139	139	244	289	246
Harvesters, forage, field, shear-bar type, self-propelled and pull	3,707	4,406	5,316	7,309	12,761
Attachments for shear-bar type, pickup and cutter-bar hay units	5,966	6,500	6,189	8,999	9,785
Row crop units, all sizes	4,301	4,476	5,707	6,857	11,800
Flail-type, including discharge spouts	946	951	1,049	2,259	3,062
Harvesters, potato	347	302	342	387	258
Harvesting machinery, other	3,989	3,028	5,031	7,816	8,108
Levelers or scrapers	4,199	4,971	4,089	6,122	6,931
Loaders, field, for baled hay	1,916	2,000	2,929	2,868	6,457
Loaders, tractor mounted, farm	26,153	18,547	17,243	23,322	36,547
Mills, feed, farm size (includes grinders and crushers of the hammer, burr or roller types)	2,623	3,334	4,206	6,481	8,035
Mixers, feed, farm size	1,894	1,886	2,293	3,094	3,162
Mowers, cutter bar-type	5,443	4,515	6,550	7,687	8,586
Mower-conditioners, self-propelled and pull-type	19,218	15,048	20,051	31,059	38,071
Planters, corn and cotton, all types	58,674	34,530	108,394	163,096	156,482
Planters, row crop units (quantity in number of rows)					
Plows, chisel or sweep type:					
Pull-type	4,001	3,681	4,910	6,738	14,313
Mounted	2,065	2,119	4,061	4,618	6,094
Plows, disk-chisel combination	4,753	3,569	4,105	6,059	3,195
Plows, disk, 1-way, 2-way (harrow, cylinder, great plains, all sizes)	2,727	2,360	3,010	4,832	8,302
Plows, subsoiler					
Plows, terracing and ditching	1,029	1,057	1,039	1,756	2,383
Plows, moldboard					
Pull-type, one-way	580	551	998	2,503	3,263
Mounted, 1-way	2,387	2,460	3,081	6,111	8,680
Semi-mounted, 1-way	1,053	1,501	2,197	11,485	11,817
Pull-type and mounted, 2-way	1,011	1,212	2,262	3,297	2,999
Plows, other (except snow)	4,386	3,706	5,482	4,654	6,111
Rakes, hay, side-delivery	9,069	7,266	10,089	13,615	19,707
Sprayers, field and row crop type:					
Power, self-propelled	1,740	1,202	2,305	2,010	3,516
Power, tractor-mounted	17,205	16,024	18,589	24,250	25,549
Power, non-tractor-mounted	6,492	5,231	5,197	8,898	14,089
Sprayers, power, not field or row crop type	4,930	5,246	6,660	6,203	7,444
Sprayers, power, air-carried	3,650	3,576	5,742	6,996	6,286
Spreaders, manure:					
Conveyor type	8,018	9,177	9,067	11,802	17,029
Tank type	3,448	2,274	2,533	4,540	7,188
Stackers, throwers, for hay	3,999	3,259	3,722	8,584	1,175
Tillage equipment, combination roller/harrows, disk or coulter, field cultivators, disk or coulter/spring tooth	5,341	3,298	3,325	6,356	8,193
Tool bars, basic units, pull, mounted	1,663	1,267	3,446	4,416	4,277
Tractors, tracklaying type	8,670	7,247	7,159	15,789	18,208
Tractors, wheel					
Farm type	50,271	45,966	64,784	118,209	118,240
Non-farm type	6,206	5,767	5,323	7,480	10,029
Transplanters and broadcast seeders	15,263	17,298	21,308	23,854	20,872
Wagons, farm type, chassis only, and trailer gear	24,471	21,540	24,880	42,249	46,642
Wagon boxes and racks for mounting on wagons and trailer gear					
Manual unloading or dump	14,423	10,454	9,675	14,621	16,998
Gravity unloading, grain type	6,687	5,807	9,361	13,506	24,028
Power unloading	9,304	10,040	10,310	14,864	18,038
Wagon boxes with integral running gear	2,380	2,828	3,385	5,559	5,737
Windrowers for grain, pull-type	615	502	848	NA	828

In some cases, I&T has combined data because of space limitations. If you need more information from MA-35A, write us.
 DATA: Current Industrial Reports, Series MA-35A, Bureau of the Census. NA—Not available or not applicable.

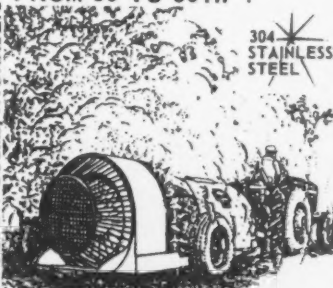


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FIEI Forecast

(Continued from page 24)

-50,000 units. And when 1985 bowed out, total sales were up about 12 per cent to 57,000 units.

I&T asked one industry executive involved in marketing the under-40-hp tractors how this substantial an upturn could have been missed by the forecasters.

"We underestimated the strength of that part of the market because we don't really know how to put a fence around it. Most of those tractors go for non-farm use or for farms operated as a second enterprise by professionals in other fields." One example cited was a boomlet in demand by airlines for the small tractors as haulers of baggage wagons, replacing more costly industrial vehicles.

It wasn't as dramatic, but the 40-99 horsepower tractor group pulled a mild upset. The industry sold 38,000 of them in 1984 and in the spring of 1985, the prediction was that sales would ease off to 36,750 units. Wrong again; sales in 1985 finished about dead even with 1984. For 1986, the forecasters are looking for sales to hang at about the same level.

Things got darker from there on in the forecasting and selling of tractors of 100 horsepower and over. In 1984, 24,495 units were sold. For 1985, the consensus was that this volume would hold, but the year wound up with a very large drop—to about 18,000 tractors.

Four-wheel-drive predictions and sales results were even worse: Predicted—sales of 3,800 units, reduced to 3,500 by spring. Results—2,600 units sold, down by a third.

Other field equipment

Manufacturers of moldboard plows, looking at a 1985 sales decline of 11.5 per cent, expect another five per cent drop in 1986 and a leveling out in 1987. Disk harrow producers, after a 16 per cent slide in 1985, see 1986 holding at the

1985 level, with a modest upturn in 1987.

Field cultivators, down 8 per cent in 1985, were seen as having sales hold steady in 1986 and improve a few percentage points in 1987. The year past was easier on the chisel plow group, which estimated only a 5 per cent loss. This year is expected to show a 2.5 per cent increase, followed by another one in 1987 of 4.5 per cent.

Manure spreaders fell off sharply in sales last year, an estimated 13 per cent. A lighter decline, 3 per cent, is seen for 1986, and no change for 1987.

Farmstead equipment

Manufacturers of farmstead equipment have a decidedly brighter outlook for 1986 on a product-by-product basis. The auger and elevator producers see a 5 per cent sales improvement in 1986 and one just like it in 1987. Makers of in-bin crop dryers are looking for a 10 per cent improvement in 1986, then no change in 1987. The batch and continuous-flow dryer executives expect sales to go up 8 per cent in 1986 and 7.5 per cent in 1987.

Makers of equipment for feeding dairy and beef cattle expect a modest 2 per cent rise in 1986 and a 3 per cent increase in 1987. Hog equipment producers don't expect any change this year but a 5 per cent improvement next year.

Grain bin manufacturers expect a 10 per cent rise this year and no change from that level in 1987. Milking machine executives see no changes either year from their 1985 experience.

All these percentages are median estimates; individual product predictions can vary wildly. Makers of in-bin crop dryers, for instance, see anything from up 25 per cent to down 30 per cent in arriving at their 10 per cent improvement estimate for 1986. Similarly, producers of chisel plows, estimating a median 2.5 per cent improvement this year, have a range of estimates running from plus 35 per cent to minus 5 per cent. □

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Massey Changes

(Continued from page 14)

from last year's 220,000 units to 249,000 in 1990 and 260,000 by 2000.

And demand for tractors of over 80 horsepower is expected to go up on a worldwide basis, according to MF—from 149,000 last year to 179,000 by 1990 and holding at 176,000 in 2000. Most of the growth will be experienced in developing parts of the world.

Massey has a pretty solid position in the Third World, but its competitors probably have a similar world outlook and will be working toward enlarging their positions there over the next 15 years. Meanwhile, Massey must concentrate on holding present tractor market shares in Europe and North America.

In I&T's opinion, if Massey-Ferguson can regain a position of steady profitability, its earnings will best be directed at strengthening its tractor product line through all important horsepower ranges and further upgrading its dealer organization in Europe and North America.

Massey-Ferguson has come a long way since the rumors were going around in the fall of 1980 that they were about to go bankrupt. It seems unlikely that they are finished with major changes. □

Book Looks

The Rise and Fall of IHC

The story of International Harvester's rise to industry giant and fall to failure, with special attention to the people who ran the company, is told in lavish detail by Barbara Marsh, in *A Corporate Tragedy*, the agony of International Harvester Co., published by Doubleday & Co., Garden City, N.Y.

Tractor Tests Revisited

Nebraska Tractor Tests Since 1920, by C.H. Wendel, provides a photo and capsule report on each machine tested at the lab since it began. An interesting look back through time, the book is available from Crestline Publishing Co., 1251 N. Jefferson, Sarasota, Fla. 33577.

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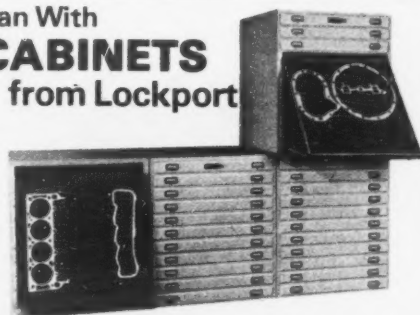
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STAY AHEAD OF THE FIELD

Auction Prices

Asterisk beside price indicates highest bid offered on tractors that were not sold.

JONES FARM EQUIPMENT CO. Dothan, Alabama December 10, 1985

ALLIS-CHALMERS TRACTOR

7060, duals, 1975 (Good) 6200

CASE TRACTORS

1370 diesel, 1973 (Good) 8000*
1170, cab, 1970 (Good) 5000*
1070 diesel, cab, 1975 (Fair) 2075*

FORD TRACTORS

7700 diesel, 1977 (Fair) 6000
7000 diesel, 1975 (Good) 5000*
5000 diesel, 1973 (Good) 3050
5000 diesel, 1969 (Good) 4400
5000 diesel, 1966 (Good) 2650*
5000 diesel, (Fair) 2600*
4110 diesel, 1982 (Excellent) 5500*
4000 diesel, 1975 (Good) 3950
4000 diesel, 1974 (Good) 3800
4000 diesel, 1974 (Good) 3600
4000 diesel, 1974 (Good) 3600
4000 diesel, 1974 (Good) 3550
4000 diesel, 1974 (Good) 2600
4000 diesel, 1969 (Good) 3700
4000 diesel, 1969 (Fair) 2400
4000 diesel, 1967 (Fair) 2300*
4000 diesel, 1963 (Fair) 1500*
3910 diesel, (Good) 7800*
3910 diesel, (Excellent) 7850
3600 diesel, 1976 (Good) 4350
3600 diesel, (Good) 5400*
3600 diesel, (Good) 2900*

3000 diesel, 1975 (Good) 2500*
3000 diesel, 1974 (Good) 2500
3000 diesel, 1973 (Good) 3400
3000 diesel, 1972 (Good) 2500
3000, (Good) 3500
3000 diesel, 1970 (Good) 3900
3000 diesel, 1969 (Good) 2900*
3000 diesel, 1966 (Good) 2350
2000 diesel, 1973 (Good) 2850
2000 diesel, 1966 (Fair) 2500
2000 diesel, 1965 (Good) 2300*
2000 diesel, (Fair) 1800*
841, 1959 (Good) 2100
841, 1957 (Good) 2150
601 diesel, (Good) 2600*
601, (Rough) 1000
Dexta, (Fair) 975
Dexta, (Rough) 825
9N, (Rough) 675
8N, (Fair) 1375
8N, (Fair) 1125
8N, (Fair) 1100*

INTERNATIONAL HARVESTER TRACTORS

784 diesel, 1978 (Good) 5650
674 diesel, cab, 1977 (Good) 4750
674 diesel, cab, 1976 (Good) 4750
674 diesel, cab, 1975 (Good) 5200
674 diesel, cab, 1975 (Good) 4050
674 diesel, (Fair) 1850
574 diesel, cab, 1977 (Good) 4000
574 diesel, cab, 1975 (Fair) 3350*
574 diesel, cab, 1975 (Good) 3450
574 diesel, cab, 1974 (Good) 4300
574 diesel, cab, 1974 (Good) 4200
574 diesel, 1974 (Fair) 2900

574 diesel, 1972 (Good) 4100
544 diesel, 1970 (Good) 2800
504, (Fair) 1100
454 diesel, cab, 1975 (Good) 3900
454 diesel, cab, 1975 (Good) 3000
444 diesel, 1970 (Good) 2600
B414 diesel, (Fair) 1300
100, cult., (Fair) 1000
Super C, (Fair) 850*
Super A, (Fair) 1150*
Cub, (Rough) 800*

JOHN DEERE TRACTORS

4040 diesel, cab, 1978 (Good) 7500
4020 diesel, 1964 (Rough) 1900*
3120 diesel, (Good) 2750*
3120 diesel, (Good) 1050
2840 diesel, cab, 1979 (Good) 5750
2630 diesel, 1975 (Good) 4000
2440 diesel, 1976 (Good) 4650
2030 diesel, (Fair) 3000
2030 diesel, cab, 1975 (Good) 4600
2030 diesel, 1973 (Good) 4200
2020 diesel, 1966 (Fair) 2550
2010 diesel, (Rough) 1400
1010, (Fair) 1950*
302 diesel, 1974 (Good) 3100
302 diesel, 1974 (Good) 2900

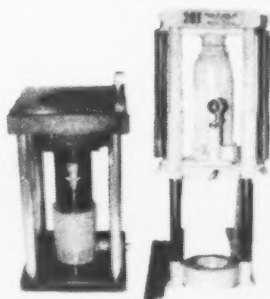
MASSEY-FERGUSON TRACTORS

1085 diesel, 1976 (Good) 3800
1085 diesel, 1975 (Fair) 4000
1085 diesel, 1975 (Good) 4750
1155, duals, 1977 (Good) 5000*
1105 diesel, 1976 (Good) 3500*
575 diesel, (Fair) 1500*
282 diesel, 1984 (Excellent) 8500*

275 diesel, 1975 (Good) 4750
275 diesel, cab, (Good) 4850
265 diesel, 1975 (Good) 5000
255 diesel, 1979 (Good) 3800
255 diesel, 1975 (Good) 4700*
250 diesel, (Good) 6500
245 diesel, 1977 (Good) 4900
235 diesel, 1975 (Good) 3700*
235 diesel, 1975 (Good) 3600
175 diesel, (Fair) 2825
175 diesel, 1973 (Fair) 2700
175 diesel, 1966 (Fair) 2750
175 diesel, (Good) 1600*
165 diesel, 1975 (Fair) 2300*
165 diesel, 1974 (Good) 3500
165 diesel, 1973 (Good) 3250
165 diesel, 1970 (Good) 1850
165 diesel, 1969 (Fair) 2000
165 diesel, 1967 (Good) 3000
150, 1965 (Good) 2600
135 diesel, 1973 (Good) 3350
135, 1972 (Good) 3900
85 diesel, 1960 (Fair) 2100
85 diesel, (Fair) 1700
85, (Fair) 1100
50 diesel, 1962 (Fair) 1700
35, (Fair) 2150
35, 1961 (Fair) 2000
35 diesel, 1961 (Fair) 2100
35 diesel, 1961 (Fair) 2000
35, 1960 (Good) 1600
35, (Fair) 1550*
35 diesel, 1960 (Rough) 850*
TC30, (Rough) 950
TC30, (Rough) 800

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Auctions

(continued)

TO20, (Rough) 775
25, (Fair) 2100*

LONG TRACTORS

560, (Good) 1975
445 diesel, (Fair) 1100
360 diesel, (Good) 2000

SATOH TRACTOR

Bull diesel, (Good) 2500

YODER & FREY, INC. Archbold, Ohio December 10, 1985

JOHN DEERE TRACTORS

70, 1954 (Fair) 900*
2440 diesel, 1978 (Rough) 5800*
620, (Fair) 1125
620, 1957 (Fair) 1475
620, ... 1300
630 diesel, 1959 (Fair) 1750
720, 1957 (Good) 2130
730 diesel, 1958 (Fair) 2000*
820, 1957 (Fair) 2150
1020, 1970 (Rough) 2250
2010, 1962 (Rough) 2100*
3020 diesel, 1968 (Good) 4550
3020, 1968 (Good) 2400*
3020, 1964 (Good) 3150
3020 diesel, 1965 (Good) 3750
4000, 1971 (Good) 4300*
4010 diesel, 1963 (Fair) 4950
4010 diesel, 1963 (Good) 4000*
4020 diesel, 1968 (Good) 5700*
4020 diesel, 1965 (Good) 4900*

4020, 1964 (Fair) 2700*
4020 diesel, 1967 (Good) 5450
4020 diesel, 1965 (Fair) 5150*
4020 diesel, 1967 (Fair) 5000*
4020 diesel, 1966 (Good) 8250*
4230 diesel, 1971 (Good) 7000*
4320 diesel, 1972 (Good) 6800*
4320 diesel, 1967 (Fair) 4100*
4320 diesel, 1972 (Fair) 6250*
4430 diesel, 1975 (Fair) 13,500*
4430 diesel, 1976 (Good) 9000*
4430 diesel, 1974 (Good) 9250*
4440 diesel, 1979 (Good) 15,500*
4440 diesel, 1980 (Fair) 14,500
4440 diesel, 1980 (Good) 17,000
4520 5300
4620 diesel, 1971 (Fair) 6500
4620 diesel, 1971 (Good) 6500*
4630 diesel, 1977 (Rough) 7000*
7630 diesel, 1978 (Good) 10,000*
4840 diesel, 1979 (Good) 19,000*
6030, 1972 (Fair) 7500*
7520 diesel 8800
4430 diesel, 1975 (Good) 11,000*
4430 diesel, 1973 (Fair) 9200

CASE/DAVID BROWN TRACTORS

730, 1965 (Rough) 1175
830, 1965 (Fair) 1200
830, 1965 (Fair) 800
930, 1965 (Fair) 1800
1270 diesel, 1974 (Fair) 5200*
2390 diesel, 1979 (Fair) 11,500*

FERGUSON & MASSEY-FERGUSON

TRACTORS

TO-20, 1949 (Rough) 950
TO-30, 1951 (Good) 1700*
44, 1949 (Good) 425*

35, 1961 (Fair) 1700
35 diesel, 1963 (Rough) 1700*
35 diesel, 1961 (Good) 1900*
65, 1963 (Rough) 1775
135 diesel, 1969 (Rough) 2400*
135 diesel, 1972 (Fair) 2500
165 diesel, 1973 (Good) 3250
165 diesel, 1970 (Rough) 2250*
165 diesel, 1967 (Rough) 2200
165 diesel, 1969 (Rough) 3100*
165, 1968 (Fair) 3350
165, 1972 (Fair) 2350
165, 1967 (Rough) 2600*
165, (Rough) 1500
165, 1971 (Fair) 3000*
180 diesel, 1967 (Fair) 3300*
245 diesel, 1979 (Good) 5725
255, 1979 (Good) 5400*
265 diesel, 1980 (Fair) 3600*
265 diesel, 1985 (Excellent) 5500
285 diesel, ... 4900
285 diesel, 1978 (Fair) 5250
1085 diesel, 1967 (Fair) 2600*
1100, (Good) 4400*
2705 diesel, 1979 (Fair) 9450
290 diesel, 1985 (Excellent) 8500*
290, 1985 (Excellent) 8250

OLIVER TRACTORS

77, 1953 (Fair) 700
77 diesel, 1954 (Fair) 525*
88, 1954 (Good) 700
550, 1957 (Rough) 1650*
550 diesel, 1958 (Rough) 1400
770, 1958 (Fair) 600
1650, 1967 (Fair) 2550
1650 diesel, ... 1550
1655, ... 3250
1850 diesel, 1965 (Good) 3500*

1855 diesel, 1973 (Good) 4300*
1855 diesel, 1972 (Good) 3800*
1855 diesel, 1972 (Good) 3900*
1855 diesel, 1972 (Good) 4500
2255, ... 5400

COCKSHUTT TRACTORS

35, 1954 (Fair) 600
1800, 1962 (Fair) 2100

MINNEAPOLIS-MOLINE TRACTOR

445, 1962 (Fair) 575

INTERNATIONAL HARVESTER TRACTORS

A, 1951 (Rough) 1475*
Cub, 1950 (Fair) 1050*
H, 1940 (Rough) 470*
H, 1949 (Fair) 600*
H, 1942 (Fair) 410
SH, 1952 (Fair) 550
M, 1546 (Rough) 600*
M, 1951 (Rough) 750*
M, 1947 (Rough) 750
M, 1950 (Rough) 675*
Sup. M, 1952 (Fair) 750*
Sup. M, 1952 (Good) 1175
Sup. M, 1947 (Fair) 725*
384, 1978 (Good) 6250
400, 1959 (Rough) 725*
450, 1956 (Fair) 1375
454, 1971 (Fair) 5300
460, 1960 (Rough) 1300
504, 1967 (Fair) 1800*
560 LP, 1960 (Good) 1600*
574 diesel, 1976 (Fair) 3100
656, 1970 (Good) 3500*

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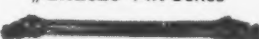
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656 diesel, 1970 (Rough)	3400*
656, 1968 (Fair)	2600*
706 diesel, 1963 (Fair)	2800*
756 diesel	3400
766, 1972 (Fair)	5000*
806, 1966 (Fair)	3450*
806, 1967 (Rough)	2650
806 diesel, 1965 (Fair)	4300*
806 diesel, 1964 (Fair)	3850*
806 diesel, 1965 (Good)	4000
806 diesel, 1966 (Good)	3900*
806 diesel, 1968 (Good)	5400
800, 1964 (Fair)	3000
806, 1964 (Fair)	3600*
806, 1965 (Fair)	1500*
806, 1963 (Fair)	1900*
806 LP, 1964 (Rough)	1700*
826, 1970 (Good)	3900*
856 diesel, 1967 (Fair)	5300*
856 diesel, 1967 (Good)	5000*
856 diesel, 1969 (Good)	4500*
966 diesel, 1974 (Good)	7100*
966, 1972 (Good)	5400*
966 diesel, 1973 (Fair)	6200*
966, 1973 (Fair)	5800

1066 diesel, 1972 (Fair)	5750
1066 diesel, 1974 (Fair)	7500*
1066 diesel, 1974 (Good)	6700*
1066 diesel, 1973 (Good)	6600*
1086 diesel, 1978 (Good)	11,000*
1086 diesel, 1977 (Good)	10,750
1206 diesel, 1966 (Fair)	3750
1256 diesel, 1970 (Rough)	3100*
1486 diesel, (Fair)	6000
1486 diesel, 1973 (Good)	6600
1486 diesel, 1973 (Fair)	6300
1486 diesel, 1979 (Good)	10,250*
1486 diesel, 1978 (Rough)	6000*
1566 diesel, 1974 (Fair)	8000*
1586 diesel	7500
1586 diesel, 1975 (Fair)	10,500*
4586 diesel, 1979 (Good)	12,500*

ALLIS-CHALMERS TRACTORS

G, 1950 (Fair)	675
WD, 1950 (Rough)	575*
WD, 1950 (Good)	600
WD, 1947 (Fair)	520
WD-45	525
D-15, 1967 (Good)	2100

D-15, 1967 (Fair)	2725
D-17	1850
D-17, 1966 (Good)	2550
D-17, 1967 (Fair)	2100*
D-19 diesel, 1965 (Fair)	2200*
D-19, 1966 (Fair)	1950
185 diesel, 1976 (Fair)	4900
185 diesel, 1975 (Good)	6000*
190, 1966 (Fair)	2425
190XT diesel, 1968 (Rough)	2950*
190XT diesel, 1970 (Good)	4325
200 diesel, 1971 (Fair)	4200*
7030 diesel, 1973 (Good)	4600*
7040	6000
7060 diesel, 1975	7100*
7060 diesel, 1979 (Good)	10,500*
7580 diesel, (Good)	9200*

FORD TRACTORS

8N, 1950 (Fair)	1000*
9N, 1944 (Good)	1310
9N, 1947 (Rough)	1050
9N, 1945 (Rough)	950
800, 1957 (Rough)	1800*
2000, 1964 (Rough)	2350

4000, 1973 (Good)	5600
4000 diesel, 1966 (Rough)	3400*
5000 diesel, 1970 (Fair)	2800*
5000 diesel, 1972 (Rough)	3750*
5000 diesel, 1965 (Fair)	3875
8000 diesel, 1972 (Fair)	4500*
8600 diesel, 1975 (Fair)	5000
860, 1956 (Good)	2300
860 diesel, 1957 (Rough)	1600
7600 diesel, 1985 (Excellent)	10,900*
7600 diesel, 1978 (Fair)	5250
7600 diesel, 1977 (Fair)	5900*
9700 diesel, 1979 (Fair)	8500*

WHITE TRACTORS

2-85 diesel, 1977 (Good)	7800
2-85 diesel, 1977 (Fair)	4650
2-105 diesel, 1975 (Rough)	5500*
2-135 diesel, 1977	8000*

DEUTZ TRACTORS

DX160 diesel, 1981 (Good)	14,000*
D6206 diesel, (Rough)	4100*
D6806 diesel (Fair)	8100
D10006 diesel (Rough)	1900

NOTES:

Prices reported are for individual sales at wholesale on an "as is," "cash and carry" basis. Prices reported are not averages.

Condition Classifications:

EXCELLENT: Engine in perfect condition, 400 to 600 hours of use. Rubber—80% tread remaining, no breaks or cracks. Paint—original and bright. General appearance: excellent.

GOOD: Engine in good running condition. Rubber—70% tread remaining, no

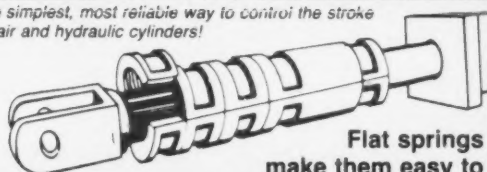
breaks or cracks. Paint—original or a good repaint job. General appearance: good over-all.

FAIR: Engine possibly in need of a minor overhaul. Rubber—60% tread remaining, some cracking evident in sidewalls. Paint—only fair, weathered and some rust apparent. General appearance: worn, some dents, minor parts (gauge covers, etc.) missing or broken.

ROUGH: Engine obviously in need of a major overhaul. Rubber—smooth. Paint—scarred, weathered, rusty. General appearance: dents, ruptures, broken parts, loose wires, components (such as lights) broken, missing or inoperative.

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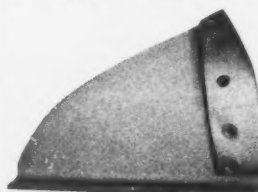
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Finally there is a rotary bar that will out-last the harvest! Made from solid chrome-alloy they'll out-last conventional bars 2 to 1. We guarantee them against wearing out for one (1) year or 500 hours.



Bars shown: 590 hours
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Implement & Tractor

The business magazine of the farm and industrial equipment industry

MARCH 1986

Laws to Curb Company Stores? page 6

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BETHESDA MD 20814

**Charging for
ALL the hours**

page 24

**Reconstruction:
The Case-IH Put-Together
page 8**

IMPLEMENT & TRACTOR

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The business magazine of the farm and industrial equipment industry.

Implement & Tractor

March 1986 • Vol. 101 • No. 4



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- 8: Was It a 'Two-Loser' Merger?** The first big put-together in the current farm machinery shakeup paired J I Case with International Harvester. This second in an I&T series on the industry's restructuring looks at how that merger is managing.
- 14: Will Mower Disks Harvest Soybeans?** USDA researchers at Illinois are checking out a replacement for the reciprocating cutterbar.
- 16: Indelicate Topic Spurs Dutch Machinery.** A mountain of manure is building up in the Netherlands, and machinery builders there are dashing to cash in.
- 20: Simplified Steiger Lineup Features Row Crop Model.** A completely new tractor model and a cutback to only five production models marks the 1986 offerings from the North Dakota builder.
- 24: 'Notify That Customer.'** When labor charges escalate, this industrial dealership rarely downscales the cost of service labor on repair work.
- 28: A Look at 22 Equipment Sellers' Results.** This FDO survey report is not a statistician's dream, but it may give you some insights.
- 34: Dealers React to Ford-New Holland Deal.** Most think it's a good thing for themselves and the industry, but there's some disagreement on which of the two companies is the best operator.

On the cover...Alan Dobson is one of the service technicians at Bob Sharp, Inc., St. Louis Ford industrial equipment dealer.

DEPARTMENTS

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Exports, Imports Down; Balance Narrows

United State's exports of farm machinery declined 17 per cent in 1985 from 1984's \$2.235 billion to \$1.855 billion. Farm machinery imports declined from \$1.729 billion in 1984 to \$1.558 billion in 1985. The favorable balance of trade, which was \$667 million in 1983 and \$506 million in 1984, declined to \$297 million

for 1985.

Major customers for U.S. equipment (value in millions): Canada (\$792), Mexico (\$215), Australia (\$141), Saudi Arabia (\$96), France (\$60), West Germany (\$57), United Kingdom (\$53), Venezuela (\$43), South Africa (\$29) and Belgium (\$24).

Major sources of imports

(volume in millions): Canada (\$416), Japan (\$356), West Germany (\$222), United Kingdom (\$207), Italy (\$122), France (\$69), Netherlands (\$34) and Belgium (\$29).

Tractor exports (including tractor parts) were \$952 million; tractor imports (also including parts) were \$1.003 billion.

Deere's Sales: \$701 Million

Deere & Co. had a net loss of \$34.4 million in the first period of fiscal 1986 (ended Jan. 31) on sales of \$701 million, compared with a loss of \$28.2 million on sales of \$763 million a year earlier.

Net income of financing and leasing subsidiaries in the quarter was \$13.7 million, down \$6.6 million from a year before. Insurance income went up a half-million dollars to \$7.1 million.

Trade receivables in the quarter fell by \$146 million to \$2.6 billion. North American dealers' farm equipment receivables fell by \$210 million. Worldwide production is set for 5 per cent less in 1986 than in 1985.

Briefly...

Kubota, Japan's biggest farm machinery maker, will produce tractors in Spain in order to reduce trade friction between Japan and EEC countries, according to London's *Financial Times*. Kubota will take over the tractor division of Motor Iberica, Nissan's Spanish subsidiary, and move the operation from Barcelona to Madrid. Kubota is said to sell from 5,000 to 6,000 tractors yearly in Europe.

January Retail Sales: 1985 Trends Persist

Retail sales of farm equipment in the U.S. started out the year with little significantly different from directions established in 1985. Total tractor sales were up slightly because of the strength of the

market for small, made-in-Japan tractors. Other tractor market segments were mixed; sales of major implements were substantially down. From the Farm & Industrial Equipment Institute report:

	Unit Retail Sales		Pct. Change
	January 1986	January 1985	
Farm Wheel Tractors:			
2-wheel drive			
Under 40 hp	3,157	2,462	+ 28.2
40-99 hp	2,474	2,739	- 9.7
100-139 hp	379	888	- 57.3
Over 140 hp	1,223	1,128	+ 8.4
Total 2-wheel drive	7,233	7,217	+ 0.2
4-wheel drive			
Under 200 hp	72	95	- 24.2
Over 200 hp	201	142	+ 41.5
Total 4-wheel drive	273	237	+ 15.2
Total All Tractors	7,506	7,454	+ 0.7
S-P Combines	621	742	- 16.3
Balers (Under 200-lb. bales)	249	306	- 18.6
Forage Harvesters (shear-bar type)	87	114	- 23.7
Mower-Conditioners	407	480	- 15.2

Allied Adds Lilliston to Ag Equipment Group

Allied Products Corp. has made another move into the farm equipment industry. Effective about Mar. 31, Allied will acquire the assets of Lilliston Corp., Albany, Ga., in exchange for Allied Products common stock.

In its last fiscal year, ended Oct. 31, 1985, Lilliston had sales in excess of \$25 million. The company produces cultivating equipment, grain drills and other farm equipment.

Allied's other farm equipment properties are Bush Hog Div., White Farm Equipment, Kewanee Farm Equipment Co., New Idea Farm Equipment Div. and Continental Gin.

Hesston's 1985: \$18 Million Loss

Hesston Corp. lost \$18.8 million in fiscal 1985 on sales of \$157.5 million, compared with a loss of \$4.48 million in 1984 on sales of \$191 million. Fourth-period sales this year were \$35 million, with losses at

\$8.8 million, compared with \$45.5 million in sales and losses of \$2.7 million.

According to Howard Brennenman, president, \$2.2 million in expenses accrued to cover the cost of transferring the manufacture of products from Hesston's plants in Illinois to Kansas.

Inventory Watch

What's happening to stockpiles in relation to sales.

Equipment	Inventory Levels							12-Month Sales, Jan.-Dec. 1985
	Dec. 31 1984	July 31 1985	Aug. 31 1985	Sept. 30 1985	Oct. 31 1985	Nov. 30 1985	Dec. 31 1985	
Tractors:								
Under 40 hp	38,550	38,093	39,808	40,319	41,153	44,086	46,559	-57,214
40-99 hp	32,509	27,667	27,724	27,686	26,455	26,464	25,658	37,847
Over 100 hp	29,714	24,594	24,123	23,487	23,171	22,861	22,243	17,700
Four-wheel drive	4,608	4,189	4,057	3,811	3,601	2,889	2,889	2,912
Total Tractors	105,381	94,543	95,712	95,303	94,380	96,811	97,349	115,673
S-P Combines	9,547	10,064	9,379	8,969	8,353	7,249	6,685	8,411

Source: Farm & Industrial Equipment Institute

Auction Prices

Asterisk beside price indicates highest bid offered on tractors that were not sold.

YODER & FREY, INC. Archbold, Ohio January 14, 1986

JOHN DEERE TRACTORS

A, 1946, (Fair)	365
50, 1954 (Rough)	850*
MT, Mo. 1952 (Fair)	1300
60, 1955	1025*
70	975
530, 1957 (Fair)	1550*
720 diesel, 1958	1900*
2010, 1962 (Rough)	2250
2010, 1961 (Rough)	1700*
2440 diesel, 1976 (Rough)	5700*
2510, 1968 (Good)	3700*
3010, 1961	2750
3020, 1966	2800*
3020, 1968, (Excellent)	3000*
3020, 1967, (Good)	4500*
3020, 1966, (Fair)	3500
3020, 1966	4800
4010 diesel, 1962, (Fair)	3400*
4010 diesel, 1962, (Good)	4150
4010 diesel, 1962, (Fair)	3550*
4010, 1963, (Good)	3500
4020 diesel, 1966, (Fair)	5100*
4020, 1966, (Fair)	4475
4020, 1967	4700*
4020 diesel, 1969	5600*
4020 diesel, 1962, (Good)	6150
4020, 1967, (Fair)	3100*
4020 diesel, 1966, (Good)	5100*
4120 diesel, 1965, (Good)	4800*
4120 diesel	5700
4120 diesel, 1966, (Fair)	4200*
4320, 1971, (Rough)	4000*
4320, 1972, (Fair)	4600*
4320, 1973	12,000
4320 diesel, 1973, (Fair)	5500*
4320 diesel, 1973, (Fair)	4100
4320, 1972, (Good)	6900*
4430	10,500
4430, 1975, (Fair)	10,500*
4430	10,000
4430, 1975, (Good)	10,250
4430, 1976, (Good)	9900*
4430, 1976, (Fair)	9200*
4430, 1975, (Fair)	10,850
4620, 1972, (Good)	7200
4630, 1974, (Fair)	6400
4630, 1975, (Good)	10,750*
5020 diesel, 1972, (Good)	4600*
8430, 1976, (Fair)	11,800

MASSEY-HARRIS TRACTORS

44, 1954, (Rough)	425
-------------------	-----

KUBOTA TRACTOR

245 diesel	2450
------------	------

FERGUSON & MASSEY FERGUSON

40, (Good)	7150
35 diesel, 1960, (Fair)	1950
35 diesel, 1960, (Fair)	1950*
35 diesel, 1959, (Fair)	2225
85, 1958, (Fair)	1325*
135 diesel, 1969, (Rough)	1900*
135, 1966, (Fair)	2850
165, 1972, (Fair)	2250
185 diesel, 1969, (Fair)	2050
185 diesel, 1968, (Fair)	2850
185 diesel, 1971, (Fair)	3000*
285 diesel, 1979, (Good)	5400*
290 diesel, 1984, (Excellent)	8250*
1100, 1966, (Fair)	2900
1105, 1978, (Fair)	5500*
1135, 1975, (Good)	5450

DEUTZ TRACTOR

D13006, (Fair)	8,100*
----------------	--------

CASE/DAVID BROWN TRACTORS

480B, hoe, 1975	7600
730 LP, 1964, (Fair)	1200*
730 diesel, 1966, (Good)	1100
830	550
930 diesel, 1964, (Fair)	3300*
930 diesel, 1965, (Fair)	1100*
930, 1963, (Fair)	2150
970, 1972, (Good)	4600*
1270, 1973, (Good)	5350*
1370, 1976, (Fair)	5400*
1570, 1979, (Rough)	6500*
2090, 1981, (Fair)	8700
2390, 1980, (Fair)	11,500
2670 diesel, (Fair)	9300

ALLIS-CHALMERS TRACTORS

WC, plow	550
WD	375
WD, 1947, (Rough)	350*
WD-45, cult., 1957, (Fair)	600*
D-14, ldr., 1965, (Rough)	1475
D-15, 1967, (Fair)	2050
D-17, 1967, (Fair)	2200*
D-17, 1964, (Fair)	1850
D-19, 1966, (Fair)	2175
D-19, 1967, (Fair)	1650
195 diesel, 1976	5700
190XT, 1967, (Rough)	2700
190XT, 1970, (Fair)	3450
190XT, 1970, (Fair)	2800
200, 1972, (Fair)	200
7030, 1976, (Fair)	4900
7040, 1977, (Good)	5875

7040, 1976, (Good)	5400
7580, (Fair)	9300*

INTERNATIONAL HARVESTER TRACTORS

A, cult., 1950, (Rough)	1250
Cub, bld., 1950, (Rough)	1175
154, mo., ldr.,	2500
H, 1951, (Good)	900
H, 1950, (Fair)	600*
H, 1940	450
H, 1948, (Fair)	450*
H, 1947, (Fair)	520*
M	575
M, 1950, (Rough)	675*
M, 1949, (Good)	950
M, 1952, (Fair)	700*
M, 1949, (Fair)	725
M, 1944, (Fair)	600*
M, 1949, (Fair)	700*
Sup. M, 1952, (Fair)	700*
100, 1955, (Fair)	1850*
240, 1960, (Rough)	775
400, 1957, (Rough)	675
450, 1957, (Fair)	1800
504, 1967, (Fair)	1800*
658 diesel, 1966, (Rough)	3300*
658, 1970, (Good)	3700
658 Hydro, 1970, (Good)	4500*
666 diesel, 1974, (Good)	6500*
666 diesel, ldr., 1975, (Good)	8800
708 diesel, 1966, (Fair)	2950
708, 1966, (Good)	1350
756, 1970, (Good)	4500*
766, 1974, (Fair)	4500*
766, 1974, (Fair)	3500*
766 diesel, 1972, (Good)	8600*
806 diesel, 1962, (Rough)	2125
806 diesel, 1965, (Good)	4900*
806, 1965, (Fair)	2350
806 diesel, 1965, (Fair)	4150
806 diesel, 1964, (Fair)	4750*
806, 1967	3800*
806, 1965, (Good)	3500*
806, 1970, (Good)	4200
806, 1965, (Rough)	1900*
806 LP, 1965, (Rough)	1750*
806 diesel, 1966	4150*
856, 1969, (Good)	5500*
856 diesel, 1970, (Fair)	5500*
856 diesel, 1968, (Good)	4500*
856 diesel, 1970, (Good)	4900*
856 diesel, 1975, (Fair)	3950
966, 1972, (Fair)	5600*
966	7500
966, 1973, (Fair)	5900*
966 diesel	6500
966	6500
966, 1978, (Good)	8400

1066, 1975	7700
1066, 1971	6000*
1066 diesel, 1973, (Rough)	3500
1066, 1974, (Good)	6600*
1256 diesel, 1970, (Rough)	3450
1256 diesel, 1970, (Fair)	4500
1256, 1970, (Fair)	3800
1456 diesel, 1969, (Fair)	4100*
1456, 1969, (Good)	5500
1466, 1975, (Fair)	7000*
1466, 1975, (Good)	6400*
1466 diesel, 1974, (Good)	7400*
1466 diesel, 1973, (Good)	6700*
1466, 1974, (Good)	6700*
1466, 1978, (Fair)	10,250
1566, 1976, (Good)	7300*
1566, 1971, (Good)	7600*
1586, 1978, (Good)	10,000*
H 86, 1979, (Fair)	5000
4366, 1979, (Fair)	12,500*

WHITE TRACTORS

2-70, 1975, (Fair)	5700*
2-150, (Fair)	8400
2-150, 1978, (Fair)	5300*

FORD TRACTORS

8N, 1950, (Fair)	1100
8N, 1949, (Rough)	825*
8N, ldr., 1951	1800*
8N, 1950, (Rough)	1100*
9N, 1945, (Fair)	835
9N, 1945, (Fair)	875
600, 1957, (Fair)	1950*
640, 1958, (Rough)	1950
800, ldr., 1957, (Rough)	1500*
800, ldr., 1957, (Fair)	2400
4000, ldr., 1964, (Fair)	2150
4000, 1964, (Fair)	2900
5000 diesel, 1972, (Fair)	4800
9000, 1971, (Rough)	3800
9600, 1974, (Fair)	6000*
9600, 1974, (Rough)	4400
1910, New	8250*
6800, 1979, (Fair)	4400
7610, 1984, (Excellent)	14,200
Jub., ldr., 1954, (Fair)	1900*

OLIVER TRACTORS

550, 1959, (Fair)	1900
550, ldr., 1960, (Fair)	3150
1800 diesel, 1963, (Good)	2300*
1650 diesel, 1967, (Fair)	2650
1755 diesel, 1973, (Fair)	3700*
1850, 1967, (Fair)	1850*
1855 diesel, 1973	4300*
1855 diesel, 1965	3750*

JONES FARM EQUIPMENT CO. Dothan, Ala. January 14, 1986

CASE TRACTORS

1370 diesel, 1980 (Good)	7000
1370, 1977 (Good)	4000*
1070 diesel, canopy 1976 (Fair)	2900*

FERGUSON & MASSEY-FERGUSON TRACTORS

1130, 1971 (Rough)	3900
1105 diesel, 1974 (Fair)	4100*
575 diesel, 1974 (Good)	2000
285, canopy 1980 (Good)	6600
282, 1974 (Excellent)	7000*

265, 1975 (Excellent)	6000
175, 1973 (Rough)	2700*
175 diesel, 1973 (Fair)	3400
175, 1967 (Rough)	1600
175, (Fair)	3000
175 diesel, 1964 (Fair)	2550*
185 diesel, 1974 (Rough)	1800*
185 diesel, 1970 (Fair)	2900*
185, 1968 (Good)	3175
150, 1965 (Fair)	3250
135 diesel, 1976 (Good)	3900*
135, 1975 (Good)	3475
135, 1974 (Fair)	2900*
135, 1973 (Good)	3700*
135, 1967 (Good)	3000*
35, 1974 (Rough)	1400*
35, 1962 (Fair)	1350
35 diesel, 1961 (Good)	2375

35, 1959 (Fair)	1500*
30, (Rough)	500*
30, (Good)	1260
30, 1952 (Fair)	900
TC30, 1951 (Rough)	975

FORD TRACTORS

7000 diesel, 1977 (Rough)	3300
7000, 1976 (Fair)	4800*
6700, 1977 (Rough)	5400
5000, 1976 (Good)	3700
5000, 1973 (Fair)	3300
5000, 1971 (Good)	4200
5000, 1970 (Good)	4500
5000, 1967 (Fair)	3475
5000, 1967 (Fair)	2750
4000, 1961 (Rough)	1300*
4000 diesel, 1972 (Good)	4200

4000 diesel, 1971 (Good)	4400*
4000 diesel, 1969 (Fair)	3200
4000 diesel, 1969 (Fair)	3000
4000, 1967 (Rough)	2400
4000, 1966 (Fair)	2950
4000, (Rough)	1050
4000 diesel, (Rough)	1550*
3000, (Fair)	3400
3000 diesel, 1978 (Fair)	2950
3000 diesel, 1977 (Fair)	3150*
3000, 1975 (Excellent)	3550
3000, 1975 (Good)	3500
3000, 1968 (Good)	2900
3000 diesel, 1968 (Good)	2950
3000, 1968 (Good)	2875*
2000, 1965 (Good)	1950*

(Continued on page 27)

Auctions (Continued from page 22)

2000, 1961 (Fair)	1450*
901, 1958 (Fair)	1300*
801, 1980 (Fair)	1900*
800, 1954 (Fair)	1875
Dexta diesel, 1961 (Rough)	800*
Dexta, 1961 (Fair)	1050
Super, 1958 (Rough)	800
9N, 1941 (Good)	1050
8N, 1952 (Fair)	1050
8N, 1950 (Fair)	1000
8N, 1948 (Good)	1300
8N, 1948 (Fair)	900*

INTERNATIONAL HARVESTER TRACTORS

1566, 1974 (Fair)	4700*
1486 diesel, 1977 (Good)	4100
1086, 1977 (Good)	5000
1086, 1971 (Good)	4200*
886 diesel, canopy 1977 (Good)	4500*
806, 1966 (Fair)	2500
806, 1965 (Rough)	1800
784, cab, 1978 (Fair)	5300*
674, 1977 (Rough)	1350
674 diesel, 1977, (Good)	4800

674 diesel, cab, 1977 (Good)	4600*
674 diesel, cab, 1977 (Good)	4200*
674 diesel, 1976 (Good)	3600*
674 diesel, canopy, 1975 (Fair)	3600*
666, 1972 (Good)	4000*
574 diesel, canopy, 1975 (Good)	4350
574 diesel, 1974 (Fair)	3350
574, 1974 (Good)	4200*
460 diesel, (Rough)	850
B414 diesel, 1964 (Rough)	800*
Cub, mo., 1975 (Fair)	1125*
Super C, 1951 (Rough)	375

Super C, 1953 (Fair)	800*
----------------------------	------

JOHN DEERE TRACTORS

4520, canopy, 1969 (Fair)	3600*
4040, cab, 1978 (Excellent)	9000*
3120, 1965 (Fair)	2700*
2640, 1976 (Excellent)	5300*
1020, 1971 (Good)	2700*
1020 diesel, 1966 (Good)	3400
40, 1954 (Good)	1200

NUFFIELD TRACTOR

485, (Fair)	750
-------------------	-----

NOTES:

Prices reported are for individual sales at wholesale on an "as is," "cash and carry" basis. Prices reported are not averages.

Condition Classifications:

EXCELLENT: Engine in perfect condition, 400 to 600 hours of use. Rubber—90% tread remaining, no breaks or cracks. Paint—original and bright. General appearance: excellent.

GOOD: Engine in good running condition. Rubber—70% tread remaining, no

breaks or cracks. Paint—original or a good repaint job. General appearance: good over-all.

FAIR: Engine possibly in need of a minor overhaul. Rubber—60% tread remaining, some cracking evident in sidewalls. Paint—only fair, weathered and some rust apparent. General appearance: worn, some dents, minor parts (gag covers, etc.) missing or broken.

ROUGH: Engine obviously in need of a major overhaul. Rubber—smooth. Paint—scarred, weathered, rusty. General appearance: dents, ruptures, broken parts, loose wires, components (such as lights) broken, missing or inoperative.

**Don't sell too low...
and don't pay too much...**

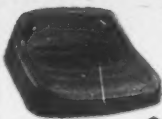
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Sug. List \$39.95 ea.
\$12.50 ea.

- 4 bolt mount
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- 16 3/4" wide - 1/2" deep - 6" high back



TWISTED CHISEL SPIKES

Sug. List \$11.79 ea.

\$3.90

- Heat treated for extra strength and longer wear life.
- Size 3/8" thick, 3" wide, 22" long
- 4 hole on 2 1/4" centers - for #3 head 1/2" dia. plow bolt.

BRAND DIRECTIONAL CONTROL VALVE

- Model AO758-T4-JRSD
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March 1986 Implement & Tractor 27

A look at 22 equipment sellers' results

It's not a statistician's dream, but it may give you some insights.

By Bill Fogarty

■WE WERE asking a lot. Our For Dealers Only survey for December requested that the participating dealer go to his records and write down the following:

1. How much volume each of his sales personnel produced in 1984. 2. How much total income (salary and commissions) the sales person received. 3. How much of his time was spent selling, as opposed to other duties. 4. The same data for the first nine months of 1985.

Well, we're grateful to the dozen dealers who did just that. From some of them, the numbers came in down to the penny. When you get a response that slim, you know that it may not have statistical validity, but because these dealers made this extra effort, we want to share our findings about their 22 sales persons.

Warning: This is no national average. It's an account of how much sales volume and personal income were produced by 22 sales

people in 1984 and by 20 of these same people in the first nine months of 1985.

In 1984, they turned in a sales volume totaling \$18.88 million, which works out to an average of \$858,000 each. But individual volumes actually ranged all over the map. The biggest producer turned in a volume of \$1.64 million. The smallest: \$88,000 in eight months, adjusted to \$132,000 if he had done a full year.

Incomes. The sales effort resulted in a total personal income of \$552,800, which averages out to \$25,100 for each of the 22 sales persons.

But the incomes, like the volumes, jumped around. Best was \$44,500; second-best was \$44,000 for the one who did that volume of \$1.64 million. Lowest income: \$12,500.

Relatively similar sales volumes didn't always produce similar incomes. It became clear, after we

studied the figures, that many of these sales persons were handling lawn and garden equipment or other lines which could, in today's market, produce more margin from a limited volume and pay them a reasonable income.

And then we divided each seller's income by the sales volume he produced. Generally, the lower the volume total was, the higher the percentage that went to the seller's income. The 1984 average was 2.9 per cent, but the range was from 1.6 to 11.9 per cent.

When we figured averages by the month, each sales person did about \$71,500 in volume and had \$2,100 in income.

To 1985. Moving to the first nine months of 1985, we saw that further softening of the farm equipment industry was reflected in what happened with this group of sales persons.

Now down to 20, the group moved \$11.83 million in equipment and had income of \$358,000. That worked out to \$591,000 per sales person, with a nine-month income of \$17,900, or sales per person per month of \$65,700 and monthly income of just under \$2,000.

Income as a per cent of sales volume went up a shade in the first nine months of 1985, to 3.0. The ranges were not as pronounced as those experienced in 1984, but they were substantial, running from 1.4 to 9.5 percent.

It's getting tougher for a dealer to pay a reasonable income to his sales people. Some of the 10 salesmen who finished 1984 in the million-dollar circle appeared unlikely to come close to their performance levels in 1985.

Time spent. We asked the responding dealers to indicate how much of the salesman's time was spent selling. We didn't have the space to define if "selling" was actual time involved in contact with sales prospects or if it was to include

22 Retail Sales Persons: Their Volume and Income

Sales Volume	Earnings - Salary and Commissions																		
	Under \$10,000	\$10,000-\$11,999	\$12,000-\$13,999	\$14,000-\$15,999	\$16,000-\$17,999	\$18,000-\$19,999	\$20,000-\$21,999	\$22,000-\$23,999	\$24,000-\$25,999	\$26,000-\$27,999	\$28,000-\$29,999	\$30,000-\$33,999	\$34,000-\$37,999	\$38,000-\$41,999	\$42,000 and over				
\$1,600,000 and over																			X
\$1,400,000-1,599,999																			X
\$1,200,000-1,399,999																			
\$1,000,000-1,199,999																			
\$800,000-999,999																			
\$600,000-799,999																			
\$400,000-599,999																			
\$200,000-399,999																			
Under \$200,000																			

all the sales-relevant actions performed by the individual. In the typical farm-industrial-lawn-garden equipment dealership many sales persons are charged with related duties.

Note: One of the top sales persons in the survey, the one who made the most money in 1984, was listed as spending 100 per cent of his time that year in the selling effort. In 1985, he was apparently moved to other duties and was involved in selling only 30 per cent of the time. His income, at least from selling, was more than halved, and so was his volume.

The average percentage of available time spent selling, according to the FDO survey, was 85 per cent in 1984 and 83 per cent in 1985; the slight difference being accounted for by one person's reported shift.

Remember, we warned you about the statistical significance of this! □

How 22 Salesmen Were Doing, 1984-85

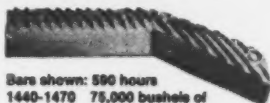
Sales Person	1984	1984 Income	Income as Pct. of Vol.	1st Nine Months			Pct. of Time Spent in Selling
	Volume (\$K)			1985 Volume (\$K)	1985 Income		
1	\$1,642	\$44,000	2.7	\$ 941	\$28,300	2.8	85
2	1,500	24,000	1.6	-	-	-	80
3	1,494	44,511	3.0	423	15,531	3.7	100/30
4	1,423	38,518	2.7	550	13,497	2.3	100
5	1,376	26,785	2.1	618	16,121	2.6	100
6	1,126	33,093	2.9	1,293	25,362	1.9	100
7	1,110	35,940	3.2	682	21,100	3.1	85
8	1,010	25,000	2.5	754	19,000	2.5	60
9	1,000	30,000	3.0	760	22,500	3.0	90
10	1,000	25,000	2.5	900	25,000	2.6	50/60
11	880	16,000	1.8	1,200	17,100	1.4	70
12	800	16,000	2.0	-	-	-	80
13	780	28,600	3.7	483	17,300	3.1	85
14	745	25,023	3.0	729	21,766	3.0	100
15	691	22,633	3.3	594	17,218	2.9	100
16	530	17,335	3.3	313	13,605	4.3	100
17	426	12,517	2.9	259	8,400	3.2	90
18	405	16,000	3.9	585	23,000	3.9	100
19	399	20,841	5.4	180	12,338	7.0	85
20	222	14,366	6.5	163	10,459	6.4	85
21	187	21,100	11.3	175	16,600	9.5	50
22	132	15,700	11.9	225	16,300	7.2	85

No. 21 worked nine months; data adjusted to 1 year.
No. 22 worked eight months; data adjusted to 1 year.

GOOD NEWS!

CASE-INTERNATIONAL ROTARY COMBINE DEALER

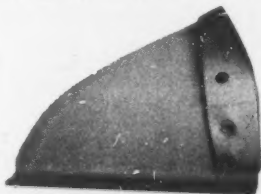
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Bars shown: 590 hours
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Impeller shown: 350 hours
1440-1470 50,000 bushels of peas,
lentils, green seed, wheat
and barley
Owner: Rich Boden—Spangle, WA

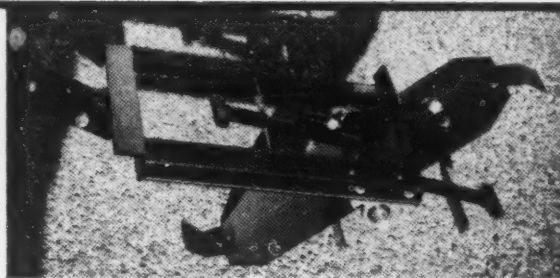
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Dealers React to Ford-New Holland Deal

Most think it's a good thing for themselves and the industry, but there's some disagreement on which company is the best operator.

■ **MOST FARM** machinery dealers see the combination of Ford and New Holland as helping their own businesses, or at least not having an adverse impact.

That's how the voting came in on the *I&T Special Reaction Survey* that ran in the November issue asking reactions to Ford buying New Holland, which was announced in October.

Of the 218 dealers who answered, 105 said the Ford/New Holland deal will help their business, while 29 said it would hurt. Another 72 said it would have no impact, while 12

said they couldn't actually give a yes or no answer. A few responses came from persons other than dealers, but not enough to include in this report.

A look at the dealers' responses is in the accompanying table, which breaks them down into whether they handle either of the affected lines.

That New Holland feeling

While many dealers made comments both for and against the merger, there was a strong tone of concern that New Holland's management style would be lost as a result of the buyout.

"Ford should let New Holland management take over Ford Tractor instead of vice versa," wrote a Ford-New Holland dealer.

Another dealer, who also handles both, wrote: "NH gives dealers better terms, more interest-free floor plan, non-recourse financing, better warranty program."

But a Deere dealer felt good about the merger because, "I feel Ford will not give away equipment in company stores as NH has been doing."

And a Ford-NH dealer commented: "NH has a very bad

HOW WILL FORD/NH DEAL AFFECT BUSINESS?

Type of Dealer	Help	Hurt	No Impact	No firm answer	Totals
Ford and NH	24	7	6	2	39
Ford (without NH)	22	1	11	3	44
NH (without Ford)	38	15	17	6	76
Neither Ford nor NH	14	0	38	2	60
Total	108	23	72	13	216

From *I&T's Special Reaction Survey*, November 1985.

marketing plan; company stores, rebates to farmers. Ford gives rebates to dealers to cover trade-ins, etc. Ford is an excellent line of tractors, with backing and marketing. This will help our industry."

Dealers speak out:

"Ford will ruin a good NH operation."

Ford/NH/Hesston dealer

"Deal will hurt my business if Ford Motor Credit gets involved with retail financing."

Ford/NH/Kubota dealer

"It will hurt unless Ford changes the philosophy currently existing in NH company stores which predominate this area. It's important to note that neither company had to do this to get healthy."

Ford/NH/Kubota dealer

"Ford quotas can and will be imposed! Result—small dealer out. Since I've seen what Ford has done to auto dealers in my area, I'm thinking of going to Deere."

NH dealer

"It will be three to four years before we know what Ford wants.... I feel it hinges entirely on how hard Ford pushes the NH combine. Will Ford force NH combines with the contract?"

A-C/Gehl dealer

"If they paint the baler blue, it's all over for NH."

Case-IH/NH/Steiger dealer

"NH personnel know and understand farming and dealers much better....let NH market the equipment and tractors. Ford Credit Co. no good!!"

Ford/NH/Steiger/Versatile dealer

"If Ford elects to strengthen the NH company stores; the independent dealer will suffer. This is the only negative aspect we see."

Unidentified

"Will help because our customers now think Ford will stay in business; hurt because we have an NH company store 25 miles away that will become a Ford Tractor dealership."

Ford dealer

"The Ford name doesn't carry the clout that NH does. Regarding industry effect: Depends on how they merchandise it. If they paint blue and push the Ford name, they'll lose market share."

Case-IH dealer

"Not sure. We dislike Ford Motor Credit so much that if they choose them over NH Credit Dept., we may be forced to quit both."

NH/Versatile/Steiger/White dealer

"In five years it will be JD and

Ford vs. two Japanese lines. The rest will go out due to lack of funds for retail contracts and leases. Ford Motor Credit is a key to what Ford Tractor is doing."

AC/Kubota/NH dealer

"Will help if Ford Credit is kept out! It will if Ford follows the marketing expertise of NH."

Unidentified

"Makes Ford a viable single franchise without needing other supporting lines."

NH/Deutz dealer

"If NH/Ford merger results in a consolidation of many dealers across the USA, it should be viewed in a positive way, since there must ultimately be fewer dealers in the USA."

Deere dealer

"It won't result in fewer dealers, which is only thing to help."

Case-IH dealer

"Ford is a much better businessman."

Deere/Gehl dealer

"Will hurt until surplus equipment is given away. Long term no change."

Deere dealer

□

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Implement & Tractor

The business magazine of the farm and industrial equipment industry

March 31, 1986

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Tractor and equipment specifications
Hydraulic components data
Nebraska test reports
Full contents page 4-5

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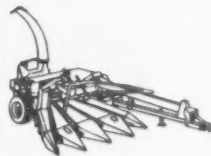
Implement &Tractor

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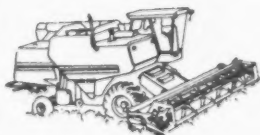
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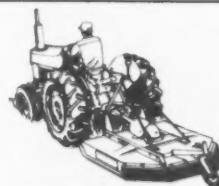
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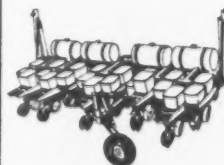
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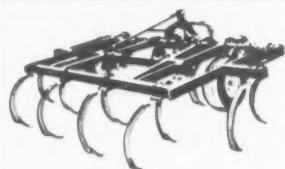
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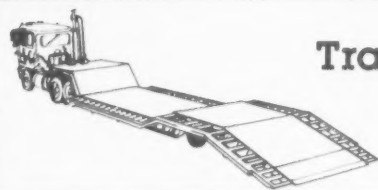
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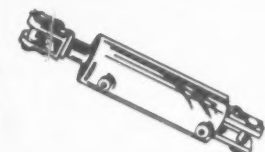
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Abbreviations:

DNA — Does not apply.

NA — Not available.

Std. — Standard.

Opt. — Optional

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*Includes thirteen 1985 tests not included in 1985 Red Book.

The Nebraska Tractor Test Law

Purpose of the Law—The Nebraska Tractor Test Law originated in 1919 for the purpose of verifying advertising claims on tractors offered for sale to Nebraska farmers.

Its position as the only independent test laboratory in the United States devoted to the evaluation of tractor performance proved of unique value to the industry. The Agricultural Tractor Test Code used in the Nebraska Tests was developed with the approval and assistance of the American Society of Agricultural Engineers and the Society of Automotive Engineers, and is revised and updated periodically as the need arises. The Test Code (ASAE S209.4 or SAE J708c) is published in the ASAE Yearbook and SAE Handbook.

Provisions of the Law—Stated briefly, the Nebraska Tractor Test Law provides:

That a stock unit of each agricultural tractor model sold in Nebraska shall be tested and passed upon by a board of three engineers under the supervision and direction of the University of

Nebraska. Each tractor must be certified as a stock model and will be equipped with the common power consuming accessories. An official representative of the manufacturer is present during the test to see that the performance meets company standards.

The Department of Agriculture shall deny to any manufacturer the right to do business in the State on complaint of two or more bona fide customers that the company has failed to maintain an adequate service station with a full supply of replacement parts within the state and within reasonable distance of customers.

The law further states that it shall be unlawful to publish excerpts from any official test in advertising material without publishing the entire report.

The provisions of the Nebraska Test Law do not apply to any tractor the engine of which develops less than 20 horsepower; or to tractors manufactured, sold and used for heavy construction when identical units are not sold and used for agricultural purposes.

Explanation of Test Reports

General

Tractors are tested at the University of Nebraska according to the Agricultural Tractor Test Code approved by the American Society of Agricultural Engineers and the Society of Automotive Engineers or official Nebraska test procedure.

The manufacturer selects the tractor to be tested and certifies that it is a stock model. Each tractor is equipped with the common power consuming accessories such as power steering, power lift pump, generator, etc., if available. Power consuming accessories may be disconnected only when the means for disconnecting can be reached from the operating station. An official representative of the company is present during the test to see that the tractor gives its optimum performance. Additional weight may be added to the tractor as ballast if the manufacturer recommends use of such ballast. The static tire loads and the tire inflation pressures must conform to the specifications of Tire and Rim Association.

Preparation for Test

The engine crankcase is drained and refilled with new oil conforming to specifications in the operator's manual. The operator's manual is also used as the guide for selecting the proper fuel and for routine lubrication and maintenance operations.

The tractor is limbered up for a minimum of three hours on the drawbar. Preliminary adjustment of the tractor is permitted at this time. Any parts added or replaced during the limber-up run, or any subsequent runs, are mentioned in the individual test reports. The tractor is equipped with approximately the amount of added ballast that is to be used during the drawbar runs.

PTO Performance

Power take-off performance runs are made by connecting the power take-off to a dynamometer. During a preliminary power take-off run the manufacturer's representative may make adjustment for the fuel, ignition or injection timing and governor control settings. These settings must be maintained for the remainder of the test. The manually operated governor control mechanism is set to provide the high-idle speed specified by the manufacturer. During the power take-off runs an ambient air temperature of approximately 75°F. (24.0°C) is maintained.

Maximum power is obtained at the rated engine speed specified by the manufacturer with the governor control lever set for maximum power. This same setting is used for all subsequent PTO runs. Time of the run is two hours. Whenever the power take-off speed during the maximum power run differs from the speeds set forth in the ASAE and SAE standards, an additional run is made at either 540 or 1000 rpm of the power take-off shaft. Time of this run is one hour.

Drawbar Performance

Maximum drawbar power is shown for the normal field speed selected by the manufacturer. All engine adjustments are the same as those used in the power take-off runs. If the manufacturer specifies a different rated engine speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified.

Maximum drawbar power is determined within the following limits: (1) slip of the drivers must not exceed 15% for pneumatic tires on the concrete test course or 7% for steel cleats on the well packed earthen test course, (2) ground speeds must not exceed 10 miles per hour, (3) safe stability limits of the tractor must not be exceeded, (4) no other operating limit of the tractor must be exceeded. Drawbar load is applied until the manufacturer's rated engine speed is obtained with maximum governor control lever setting. Travel speed, drawbar pull and other data are recorded over two 500-foot straight level areas.

Fuel consumption is determined at the manufacturer's selected travel speed with the drawbar pull set: (1) to give rated engine rpm, (2) 75% of the pull at rated engine rpm, (3) 50% of the pull at rated engine rpm, and (4) maintaining the same load and travel speed as in (3) by shifting to a higher gear and reducing the engine rpm.

This summary shows the drawbar horsepower, corresponding travel speed and fuel consumption at 100%, 75% or 50% loads, and 50% of pull at reduced engine speed.

Also shown is the maximum drawbar horsepower produced for two 500-foot travel sections and corresponding travel speed, the maximum drawbar pull and the corresponding drive-wheel slippage.

In addition, the "lugging ability" obtained by increasing the load so that the full throttle engine speed drops to 80% of rated is given as a percent increase with respect to the pull at rated engine rpm.

The maximum drawbar horsepower and the corresponding speed and drawbar pull for other selected gears or travel speeds are shown in the individual test reports.

Three-point Hitch Test

The hitch testing procedure is based primarily on standard procedures (ASAE 349.1 and SAE J283) adopted by ASAE and the Society of Automotive Engineers, plus ASAE and SAE standards for tractor 3-point hitch and quick coupler dimensions and operation. ISO (International Standards Organization) standard 7414-1982 (5), "Agricultural Equipment—Matching of Wheeled Tractors and Rear Mounted Implements—Code Numbering System," has also had a role in the test development.

According to the procedure adopted by the Board of Test Engineers July 29, 1983, "The Three Point Hydraulic Lift test will apply to all tractors brought for testing to the Nebraska Tractor Test Laboratory which have the three-point lift attachment as standard equipment or as an option." Those procedures also specify that distribution and total tractor weight will be in accordance with limits set by the tractor manufacturer, tire manufacturer and ROPS certification, and weight shall include full fuel tanks and a 175-lb. operator. Front end ballast can only be provided by a standard weight package and/or front tire ballast supplied or recommended by the manufacturer.

The tractor is tested on the same rear tires used during drawbar track tests, and front tires of 2WD or FWA tractors may be of any size or ply offered by the tractor manufacturer as long as they properly match rear tires. A quick attaching coupler is used on all Category III and IV hitches and on any other tractors on which it is offered as standard equipment. But, the quick coupler is not considered part of the load lifted by the hitch.

Measurements taken include engine temperature, crankshaft rpm, hydraulic oil pressure and temperature, vertical displacement of lower link implement attaching points, lift time, vertical movement of the applied load, plus any other variables necessary to describe system performance.

Sound Measurement

Sound is recorded during each of the Drawbar Performance runs as the tractor travels on a straight section of the test course. The dB(A) sound level is obtained with the microphone located near the right ear of the operator. Bystander sound readings are taken with the microphone placed 25 feet (7.5 m) from the line of travel of the tractor. An increase of 10dB(A) will approximately double the loudness to the human ear.

Individual copies of any test report, annual summary booklets or annual subscription (at \$5.00 for U.S. & Canada, \$8.00 for foreign) are available. For complete information write to Nebraska Tractor Test Laboratory, Department of Agricultural Engineering, The University of Nebraska—Lincoln, Institute of Agriculture and Natural Resources, Lincoln, NE 68583-0832.

NEBRASKA TRACTOR TEST 1545—ALLIS-CHALMERS 6070 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (lit)	Brake hp (kW)	Hp. to PTO (kW)	Confining medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed—500 rpm)								
70.78 (52.70)	2300	4.573 (16.573)	0.431 (0.362)	16.18 (11.99)	197 (95.8)	63 (17.3)	75 (21.8)	29.25 (98.76)
Standard Power Take-off Speed (540 rpm) — One Hour								
71.01 (52.9)	2220	4.515 (16.555)	0.424 (0.276)	16.45 (12.242)	187 (86.0)	60 (18.3)	76 (24.2)	29.25 (98.77)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

63.22 (47.14)	2417	4.142 (15.679)	0.457 (0.278)	15.26 (10.97)	194 (89.5)	66 (18.6)	75 (21.9)	—
0.00 (0.00)	2566	1.461 (5.530)	—	—	178 (80.6)	67 (19.2)	77 (24.7)	—
52.65 (39.33)	2494	2.705 (10.572)	0.598 (0.364)	11.68 (8.392)	181 (82.8)	66 (18.6)	75 (21.6)	—
70.48 (52.33)	2500	4.555 (16.476)	0.431 (0.262)	16.19 (11.99)	188 (86.6)	67 (19.2)	77 (21.6)	—
16.54 (12.34)	2551	2.155 (8.083)	0.901 (0.548)	7.75 (5.58)	178 (81.1)	65 (18.1)	73 (22.8)	—
48.12 (35.80)	2456	5.466 (20.404)	0.500 (0.304)	15.96 (11.68)	185 (83.9)	68 (20.0)	76 (24.6)	—
Ar 30.59 Ae (20.71)	2481	5.868 (21.560)	0.594 (0.337)	15.00 (10.80)	182 (80.2)	66 (19.8)	73 (21.3)	29.23 (98.69)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (lit)	Brake hp (kW)	Hp. to PTO (kW)	Confining medium	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power — Two Hours 1st (31) Gear											
58.55 (43.51)	5081 (22.69)	4.51 (6.9)	2300	8.00	4.561 (16.599)	0.522 (0.317)	15.58 (11.40)	186 (85.3)	64 (18.7)	54 (15.2)	29.06 (98.17)
75% of Pull at Maximum Power — Two Hours 1st (31) Gear											
47.68 (35.36)	5836 (27.06)	4.66 (7.3)	2435	5.91	5.877 (21.674)	0.508 (0.305)	15.30 (11.13)	185 (85.0)	66 (19.1)	50 (14.0)	29.04 (98.07)
50% of Pull at Maximum Power — Two Hours 1st (31) Gear											
33.15 (24.72)	2557 (11.37)	4.86 (7.8)	2482	5.78	5.187 (19.684)	0.871 (0.400)	10.40 (7.595)	184 (84.0)	47 (13.3)	50 (14.0)	29.86 (97.51)
50% of Pull at Reduced Engine Speed — Two Hours 5th (18) Gear											
55.25 (40.78)	2556 (11.37)	4.08 (6.5)	1410	5.58	2.578 (9.688)	0.500 (0.304)	15.96 (11.68)	185 (83.9)	54 (15.2)	60 (17.3)	29.82 (97.52)
MAXIMUM POWER IN SELECTED GEARS											
55.55 (40.91)	7987 (35.57)	2.51 (4.0)	2350	14.80	—	—	—	184 (84.0)	64 (18.7)	60 (17.3)	29.87 (97.69)
57.56 (42.77)	6495 (29.08)	3.51 (5.3)	2297	10.70	—	—	—	183 (83.8)	63 (18.1)	52 (14.6)	29.10 (98.27)
58.81 (43.86)	5114 (23.73)	4.51 (6.9)	2505	7.90	—	—	—	188 (86.6)	65 (18.1)	55 (15.2)	29.07 (98.13)
58.22 (44.16)	4894 (21.94)	5.51 (8.8)	2500	9.94	—	—	—	188 (86.6)	64 (18.7)	54 (15.2)	29.08 (98.28)
59.56 (44.42)	2920 (13.26)	7.90 (12.7)	2297	4.10	—	—	—	186 (85.3)	63 (18.1)	55 (15.2)	29.09 (98.21)

Department of Agricultural Engineering

Date of Test: October 19 to 26, 1984

Manufacturer: ALLIS-CHALMERS CORPORATION, P.O. Box 512, Milwaukee, Wisconsin 53201

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8385. Fuel weight 6.982 lb/gal (0.837 kg/l). Oil SAE 15W-40 API service classification SF-CD. To motor 2.678 gal (10.139 l). Drained from motor 2.502 gal (9.470 l). Transmission and final drive lubricant Allis-Chalmers Power Fluid 821. Total time engine was operated 32.0 hours.

ENGINE: Make Allis Chalmers Diesel Type four cylinder vertical with turbocharger Serial No. 55K20023 Crankshaft lengthwise Rated rpm 2300 Bore and stroke 3.875" x 4.25" (98.4 mm x 107.9 mm) Compression ratio 15.1 to 1 Displacement 290 cu in (4.783 m³) Starting system 12 volt Lubrication pressure Air cleaner one paper element and centrifugal pre-cleaner Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil Fuel filter one paper cartridge Muffler vertical Confining medium temperature control one thermostat.

CHASSIS: Type standard Serial No. 6070 1004 Tractor width rear 57.4" (1460 mm) to 80.0" (2030 mm) front 58" (1462 mm) to 79" (2006 mm) Wheel base 92.8" (2352 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 28.5" (719 mm) Vertical distance above roadway 36.4" (925 mm) Horizontal distance from center of rear wheel cross (0" mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Adversely speed up (km/h) first 1.0 (1.6) second 1.3 (2.1) third 1.8 (2.6) fourth 2.0 (3.3) fifth 2.9 (4.7) sixth 3.8 (6.1) seventh 4.7 (7.6) eighth 5.9 (9.3) ninth 8.5 (13.6) tenth 11.0 (17.7) eleventh 15.8 (22.2) twelfth 17.2 (27.7) reverse 0.9 (1.5), 2.7 (4.4), 8.0 (12.8) Clutch single dry disc operated by foot pedal Brakes multiple wet disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 124.6" (3.17 m) left 122.8" (3.12 m) (on concrete surface without brake) right 141.9" (3.59 m) left 144.0" (3.66 m) Turning space diameter (on concrete surface with brake applied) right 206.8" (5.28 m) left 203.0" (5.18 m) (on concrete surface without brake) right 290.3" (7.61 m) left 305.5" (7.76 m) Power take-off 540 rpm at 2228 engine rpm. Undriven tractor mass 7285 lb (3304 kg).

LUGGING ABILITY IN 7th (31) GEAR

Crankshaft Speed rpm	2305	2075	1841	1615	1378	1155
Pull—lb (kN)	5114 (22.71)	5666 (25.21)	5995 (26.87)	6094 (27.11)	6024 (26.11)	5817 (25.88)
Increase in Pull %	0	11	17	19	24	14
Power—Hp (kW)	58.81 (43.86)	56.00 (41.21)	54.07 (40.32)	47.96 (35.76)	42.23 (31.49)	32.91 (24.34)
Speed—Mph (km/h)	4.51 (6.94)	3.84 (6.18)	3.58 (5.46)	2.95 (4.75)	2.50 (4.03)	2.12 (3.41)
Slip %	7.90	9.54	9.61	9.91	10.52	9.42

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours	dB(A)
75% of Pull at Maximum Power—Test Hours	80.5
50% of Pull at Maximum Power—Two Hours	81.5
50% of Pull at Reduced Engine Speed—Two Hours	80.5
bystander in 12th (4H) gear	85.5

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 128°F (53.3°C). Five gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1545, December 5, 1984.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

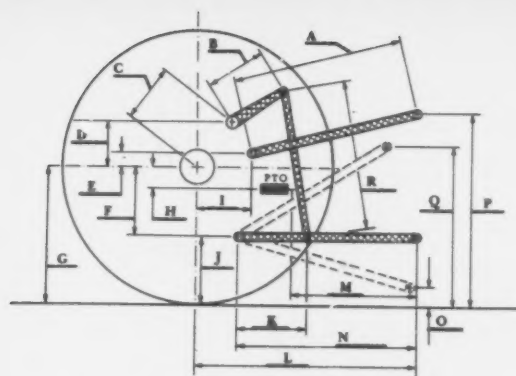
TIRE BALLAST AND WEIGHT

Ballast	With Ballast Two 16.5-34, 6, 10 (125) 780 lb (350 kg)	Without Ballast Two 16.5-34, 6, 10 (125) None
Front Tire Ballast	Two 7.50-16, 0, 36 (250) None	Two 7.50-16, 0, 36 (250) None
Height of Center of Gravity	19.3 in (493 mm)	19.3 in (493 mm)
Static Weight with Operator—Rear	5100 lb (2310 kg)	5100 lb (2310 kg)
—Front	5410 lb (2455 kg)	5410 lb (2455 kg)
—Total	10510 lb (4769 kg)	10510 lb (4769 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2325	16050
Location	remote	remote
Hydraulic oil temperature °F (°C)	182	83
Location	pump inlet	pump inlet
Maximum Lift Capacity		
QUICK ATTACH CATEGORY	no	11
LOAD lb (kg)	5100	1433
TIME sec	5.29	—
HITCH POINT MOVEMENT in (mm)		
Lowest position	9.8	240
Top of timed range	33.8	857
Highest position	36.1	918
LOAD CG MOVEMENT in (mm)		
Lowest position	9.1	230
Top of timed range	35.9	911
Highest position	39.5	1003

*Impeller load capacity for transport purposes not specified by manufacturer.
**The manufacturer's advertised capacity is 3000 lb (1361 kg).



Hitch Dimensions as Tested — No Load

	inch	mm
A	26.3	667
B	9.1	230
C	13.5	343
D	14.1	359
E	8.1	206
F	9.3	236
G	28.0	712
H	1.3	33
I	14.5	367
J	18.7	476
K	17.0	431
L	40.9	1038
M	21.3	540
N	35.6	905
O	8.0	203
P	37.8	959
Q	35.9	911
R	27.0	686



Allis-Chalmers 6070 Diesel

NEBRASKA TRACTOR TEST 1548—CASE 1896 POWERSHIFT DIESEL ALSO CASE INTERNATIONAL 1896 POWERSHIFT DIESEL

12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	Oil/Fuel ratio (l/gal)	Hp/brake (kW)	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches Hg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed—997 rpm)								
95.92 (71.33)	2100	5.739 (21.726)	0.418 (0.214)	16.71 (12.293)	187 (86.1)	56 (14.2)	75 (23.9)	29.23 (98.69)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

83.83 (62.31)	2150	5.270 (19.999)	0.459 (7.322)	15.91 (11.94)	187 (86.1)	59 (14.7)	77 (24.7)	.....
0.00 (0.00)	2275	1.934 (7.322)	.....	.....	186 (83.6)	57 (13.9)	75 (23.9)	.....
45.05 (32.09)	2217	5.632 (21.750)	0.589 (0.330)	11.85 (8.730)	187 (86.1)	58 (14.2)	75 (23.9)	.....
96.69 (72.10)	2101	5.782 (21.886)	0.417 (0.214)	16.72 (12.293)	187 (86.1)	56 (14.2)	75 (23.9)	.....
21.79 (16.25)	2244	2.811 (10.642)	0.900 (0.540)	7.75 (5.727)	194 (84.2)	58 (14.4)	73 (23.8)	.....
63.78 (47.36)	2191	4.455 (16.878)	0.487 (0.284)	14.32 (10.621)	186 (85.3)	58 (14.4)	75 (23.9)	.....
Av (58.40)	2197	3.981 (15.048)	0.559 (0.330)	12.94 (9.550)	188 (85.5)	58 (14.4)	75 (23.9)	29.19 (98.37)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lbs (N)	Speed mph (km/h)	Crank- shaft speed rpm	Oil/Fuel ratio (l/gal)	Fuel Consumption gal/hr (l/h)	Hp/brake (kW)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)
Maximum Available Power — Two Hours 8th (3-2) Gear										
84.51 (63.02)	4914 (21.86)	6.45 (10.38)	2100	3.08 (0.286)	5.705 (21.508)	0.471 (0.286)	14.82 (10.9)	192 (88.9)	45 (7.8)	29.11 (98.30)
75% of Pull at Maximum Power — Ten Hours 8th (3-2) Gear										
66.09 (49.88)	3735 (16.64)	6.72 (10.81)	2165	2.24 (0.311)	4.902 (18.536)	0.511 (0.311)	13.05 (9.688)	189 (87.1)	45 (6.2)	28.94 (97.73)
90% of Pull at Maximum Power — Two Hours 8th (3-2) Gear										
45.83 (34.18)	2490 (11.07)	6.90 (11.11)	2211	1.50 (0.296)	4.041 (15.296)	0.615 (0.374)	11.34 (8.235)	189 (87.2)	45 (7.2)	29.09 (98.23)
90% of Pull at Reduced Engine Speed — Two Hours 10th (4-1) Gear										
45.77 (34.13)	2489 (11.07)	6.90 (11.10)	1447	1.46 (0.297)	5.592 (21.233)	0.488 (0.297)	14.29 (10.4)	185 (85.0)	44 (6.7)	29.07 (98.17)

MAXIMUM POWER IN SELECTED GEARS

74.26 (55.34)	12557 (54.97)	2.25 (3.63)	2128	14.70 (10.7)	2nd (1-2) Gear	188 (86.7)	45 (7.2)	50 (10.0)	28.55 (96.60)
82.87 (61.80)	10567 (46.11)	3.00 (4.82)	2100	7.92 (5.82)	3rd (1-3) Gear	189 (86.9)	39 (3.9)	44 (6.7)	29.10 (98.27)
84.62 (63.12)	10352 (46.05)	3.07 (4.93)	2100	7.92 (5.82)	4th (2-1) Gear	187 (86.1)	39 (3.9)	45 (7.2)	29.10 (98.27)
85.80 (63.96)	7643 (34.00)	4.21 (6.77)	2100	5.33 (3.83)	5th (2-2) Gear	188 (86.4)	40 (4.4)	46 (7.8)	29.10 (98.27)
86.45 (64.66)	6790 (30.20)	4.77 (7.68)	2100	4.40 (3.10)	6th (3-1) Gear	187 (86.1)	40 (4.4)	47 (8.3)	29.11 (98.30)
85.41 (63.69)	6006 (26.72)	5.33 (8.50)	2100	3.87 (2.83)	7th (3-2) Gear	186 (85.3)	40 (4.4)	48 (8.9)	29.11 (98.30)
85.77 (63.96)	4980 (22.15)	6.46 (10.39)	2100	3.68 (2.68)	8th (3-2) Gear	189 (87.2)	41 (5.0)	50 (10.0)	29.12 (98.33)
85.05 (63.99)	3855 (17.05)	8.13 (13.00)	2100	2.52 (1.80)	9th (3-3) Gear	188 (86.7)	41 (5.0)	49 (9.4)	29.11 (98.30)

Department of Agricultural Engineering

Dates of Test: October 24 to November 7, 1984

Manufacturer: J.I. CASE COMPANY, 700 State Street, Racine, Wisconsin 53404

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8582 Fuel weight 6.979 lbs/gal (0.836 kg/l) Oil SAE 15W-40 API service classification CDSF To motor 3.548 gal (13.431 l) Drained from motor 3.211 gal (12.157 l) Transmission and final drive lubricant Case Powergard PTF transmission fluid Total time engine was operated 31.5 hours.

ENGINE: Make Consolidated Diesel Corporation - Case Diesel Type six cylinder vertical with turbocharger Serial No. *44111064* Crankshaft lengthwise Rated rpm 2100 Bore and stroke 4.016" x 4.724" (102 mm x 120 mm) Compression ratio 17.5 to 1 Displacement 359 cu in (5894 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and separator Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper cartridges Muffler underhood Exhaust vertical Cooling medium temperature control one thermostat.

CHASSIS: Type standard with duals Serial No. *9934563* Tread width rear 60" (1524 mm) to 128" (3251 mm) front 60" (1524 mm) to 46" (2235 mm) Wheel base 108" (2743 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 27.9" (708 mm) Vertical distance above roadway 40.7" (1034 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (3) range operator controlled powershift Advertised speeds mph (km/h) firm 1.9 (3.1) second 2.5 (4.0) third 3.2 (5.2) fourth 3.2 (5.2) fifth 4.3 (6.9) sixth 4.9 (7.9) seventh 5.4 (8.7) eighth 6.5 (10.3) ninth 8.1 (13.0) tenth 9.9 (15.9) eleventh 13.2 (21.2) twelfth 18.1 (29.1) reverse 3.2 (5.2), 5.4 (8.7), 8.1 (13.0) Clutch wet multiple disc hydraulically power actuated by foot pedal Brakes wet multiple disc hydraulically power actuated by two foot pedals which can be locked together Servicing hydraulic Turning radius (on concrete surface with brake applied) right 157" (3.99 m) left 157" (3.99 m) (on concrete surface without brake) right 174" (4.42 m) left 174" (4.42 m) Turning space diameter (on concrete surface with brake applied) right 326" (8.28 m) left 326" (8.28 m) (on concrete

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Ostvedt, Dean and Director

LUGGING ABILITY IN 8th (5-2) GEAR

Crankshaft Speed rpm	2103	1894	1689	1467	1264	1050
Pull—lb (kN)	4980 (22.15)	5738 (25.52)	6387 (28.41)	6804 (30.27)	7275 (32.56)	7208 (32.06)
Increase in Pull %	0	15	28	57	66	45
Power—hp (kW)	85.77 (63.06)	88.55 (66.02)	87.37 (65.15)	80.54 (60.06)	73.89 (55.10)	60.90 (45.42)
Speed—mph (km/h)	6.46 (10.39)	5.79 (9.31)	5.13 (8.26)	4.44 (7.14)	3.81 (6.13)	3.17 (5.10)
Slip %	5.08	5.55	4.18	4.49	4.80	4.80

TRACTOR SOUND LEVEL WITH CAB dB(A)

Maximum Available Power—Two Hours	77.5
75% of Pull at Maximum Power—Ten Hours	78.0
50% of Pull at Maximum Power—Two Hours	77.5
50% of Pull at Reduced Engine Speed—Two Hours	78.0
Bystander in 12th (4-5) gear	89.0

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires —No. size, ply & psi (kPa) —Liquid (each) —Tire Equip (each)	Four 18.4-58, 8, 16 (110) None 75 lb (35 kg)	Four 18.4-58, 8, 16 (110) None None
Front Tires —No. size, ply & psi (kPa) —Liquid (each) —Tire Equip (each)	Two 11.00-16, 6, 32 (220) None 65 lb (28 kg)	Two 11.00-16, 6, 32 (220) None None
Height of Drawbar	19.5 in (495 mm)	19.5 in (495 mm)
Static Weight with Operator—Rear —Front —Total	10560 lb (4789 kg) 3565 lb (1617 kg) 15025 lb (6816 kg)	10055 lb (4561 kg) 5440 lb (2460 kg) 15495 lb (7021 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2250	15510
Location	remote	
Hydraulic oil temperature °F (°C)	175	78
Location	temp	
	Maximum Lift Capacity	Lift Capacity See Transport
QUICK ATTACH CATEGORY	no	
	11	*not measured
LOAD lbs (kg)	8604	2998
TIME sec	2.47	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.5	317
Top of rated range	**35.5	902
Highest position	36.0	914
LOAD CG MOVEMENT in (mm)		
Lowest position	11.2	284
Top of rated range	41.6	1056
Highest position	42.5	1080

*Maximum load capacity for transport purposes not specified by manufacturer.

**The observed power range 23.5° (197 mm) does not meet the minimum power range 28° (610 mm) specified by ASAE Standard S317.10.

surface without brake) right 562" (9.20 m) left 562" (9.20 m) Power take-off 534 rpm at 2100 engine rpm and 997 rpm at 2100 engine rpm Unladen tractor mass 12040 lb (5461 kg).

REPAIRS AND ADJUSTMENTS: During the hydraulic lift test the control valve linkage was adjusted.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 125°F (51.7°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h).

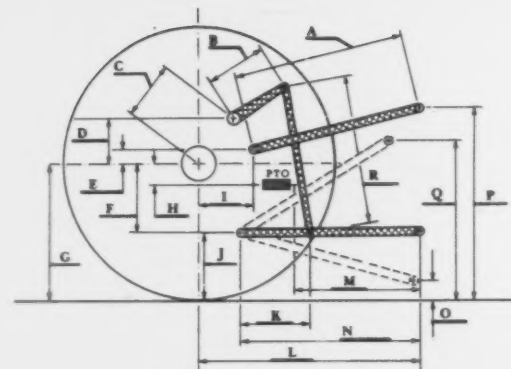
We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1348, December 5, 1984.

Report resumed. Supplemental sales permit for Case International 1896 Powershift Diesel June 18, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	22.5	572
B	12.0	305
C	14.7	372
D	13.0	330
E	6.2	157
F	12.4	315
G	31.9	810
H	0.2	5
I	20.2	512
J	19.5	495
K	17.1	434
L	42.7	1084
M	20.7	525
N	30.2	766
O	8.0	203
P	38.5	978
Q	32.8	832
R	34.1	867



Case 1896 Powershift Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1549—CASE 2096 POWERSHIFT DIESEL ALSO CASE INTERNATIONAL 2096 POWERSHIFT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
		gph (L/hr)	Temp °F (°C)	

MAXIMUM POWER AND FUEL CONSUMPTION

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
115.67 (84.26)	2100	6.657 (25.200)	0.402 (-1.24)	17.38 (1.24)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
101.61 (75.77)	2170	6.100 (23.090)	0.419 (-1.25)	16.66 (1.21)
0.00 (0.00)	2260	1.870 (7.078)	—	186 (13.4)
51.73 (38.58)	2211	5.981 (22.508)	0.557 (-1.27)	15.08 (1.07)
116.50 (86.73)	2100	6.667 (25.238)	0.400 (-1.24)	17.44 (1.24)
26.11 (19.47)	2252	2.956 (11.114)	0.785 (-1.17)	8.89 (1.75)
77.10 (57.49)	2197	5.055 (19.116)	0.458 (-1.04)	15.25 (1.04)

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
62.14 (45.34)	2195	4.435 (16.787)	0.498 (-1.03)	14.91 (1.03)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
100.56 (74.99)	5915 (26.31)	6.58 (10.26)	2101	3.90 (14.62)	6.613 (25.02)	15.21 (-1.03)

MAXIMUM AVAILABLE POWER — Two Hours 8th (3-2) Gear

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
79.68 (59.41)	4465 (19.85)	6.69 (10.77)	2184	2.84 (10.77)	5.723 (21.86)	15.92 (-1.03)

75% of Pull at Maximum Power — Ten Hours 8th (3-2) Gear

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
54.18 (40.40)	2975 (13.23)	6.83 (10.99)	2208	1.99 (7.50)	4.555 (17.16)	11.95 (-11.6)

50% of Pull at Maximum Power — Two Hours 8th (3-2) Gear

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
54.23 (40.44)	2975 (13.23)	6.84 (10.99)	1449	1.91 (7.20)	3.740 (14.17)	14.50 (-1.03)

50% of Pull at Reduced Engine Speed — Two Hours 10th (4-1) Gear

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
78.27 (58.16)	12915 (57.43)	2.27 (3.66)	2161	14.86 (56.2)	2nd (1-2) Gear	188 (13.4)

MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
94.28 (70.50)	12476 (55.49)	2.83 (4.56)	2099	12.54 (47.6)	3rd (1-3) Gear	188 (13.4)

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
95.94 (71.34)	12548 (54.91)	2.91 (4.68)	2100	12.08 (45.6)	4th (2-1) Gear	189 (13.4)

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
100.65 (75.05)	9166 (40.77)	4.12 (6.63)	2100	6.77 (25.6)	5th (2-2) Gear	188 (13.4)

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
101.28 (75.52)	8105 (36.04)	4.69 (7.54)	2101	5.80 (21.8)	6th (3-1) Gear	190 (13.4)

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
100.10 (74.64)	7145 (31.78)	5.25 (8.45)	2100	4.90 (18.4)	7th (2-3) Gear	189 (13.4)

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
101.40 (75.62)	5968 (26.54)	6.37 (10.25)	2100	5.82 (21.8)	8th (3-2) Gear	187 (13.4)

Power Hp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Temp °F (°C)	Barometer in. Hg (kPa)
98.65 (73.17)	4605 (20.48)	8.04 (12.87)	2100	2.95 (11.1)	9th (3-3) Gear	187 (13.4)

Department of Agricultural Engineering

Dates of Test: October 24 to November 5, 1984

Manufacturer: J.I. CASE COMPANY, 700 State Street, Racine, Wisconsin 53404

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8382 Fuel weight 6.979 lbs/gal (0.836 kg/L) Oil SAE 15W-40 API service classification CD/SF To motor 3.549 gal (13.436 L) Drained from motor 3.109 gal (11.768 L) Transmission and final drive lubricant Case Powergard PTF transmission fluid Total time engine was operated 32.5 hours.

ENGINE: Make Consolidated Diesel Corporation-Case Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. 6TA-590/4411446 Crankshaft lengthwise Rated rpm 2100 Bore and stroke 4.016" x 4.724" (102 mm x 120 mm) Compression ratio 16.5 to 1 Displacement 359 cu in (5884 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper cartridges Muffler underhood Exhaust vertical Cooling medium temperature control one thermostat.

CHASSIS: Type standard with duals Serial No. 9935403 Tread width rear 60" (1524 mm) to 100" (2540 mm) front 60" (1524 mm) to 88" (2235 mm) Wheel base 108" (2743 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) horizontal distance forward from centerline of rear wheels 27.1" (688 mm) Vertical distance above roadway 40.7" (1034 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (3) range operator controlled powershift Advertised speeds mph (km/h) first 1.9 (3.1) second 2.5 (4.0) third 3.2 (5.2) fourth 5.2 (8.4) fifth 4.3 (6.9) sixth 4.9 (7.9) seventh 5.4 (8.7) eighth 6.5 (10.3) ninth 8.1 (13.0) tenth 9.9 (15.9) eleventh 13.2 (21.2) twelfth 18.1 (29.1) reverse 3.2 (5.2), 5.4 (8.7), 8.1 (13.0) Clutch wet multiple disc hydraulically power actuated by foot pedal Brakes wet multiple disc hydraulically power actuated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 157" (3.99 m) left 157" (3.99 m) (on concrete surface without brake) right 174" (4.42 m) left 174" (4.42 m) Turning space diameter (on concrete surface with brake applied) right 326" (8.28 m) left 326" (8.28 m) (on concrete

LUGGING ABILITY IN 8th (3-2) GEAR

Crankshaft Speed rpm	2100	1890	1680	1472	1256	1042
Pull—lb (N)	5968 (26.54)	9020 (29.43)	7141 (31.76)	7743 (34.44)	8311 (36.97)	7537 (33.33)

Increase in Pull %	0	11	20	30	39	26
Power—Hp (kW)	101.40 (75.62)	100.59 (75.01)	96.16 (71.20)	90.83 (67.24)	81.44 (60.73)	62.64 (46.71)

Speed—Mph (km/h)	6.37 (10.25)	5.70 (9.17)	5.05 (8.13)	4.40 (7.08)	3.67 (5.91)	3.12 (5.02)
Skip %	5.82	4.59	4.90	5.35	5.80	5.20

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours	77.0
75% of Pull at Maximum Power—Ten Hours	77.5

50% of Pull at Maximum Power—Two Hours	77.0
50% of Pull at Reduced Engine Speed—Two Hours	74.5

bystander in 12th (4-5) gear	87.5
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TRACTOR SOUND LEVEL WITH CAB	dB(A)
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Maximum Available Power—Two Hours	77.0
75% of Pull at Maximum Power—Ten Hours	77.5

50% of Pull at Maximum Power—Two Hours	77.0
50% of Pull at Reduced Engine Speed—Two Hours	74.5

bystander in 12th (4-5) gear	87.5
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Tires, Ballast and Weight	With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi (kPa)	Inner Two 18.4-38, 8, 16 (110)

Ballast	—Liquid (each)	None
—Cast iron (each)	101 lb (45 kg)	None

Front Tires	—No., size, ply & psi (kPa)	Two 11.00-16SL, 6, 32 (220)
Ballast	—Liquid (each)	None
—Cast iron (each)	58 lb (26 kg)	None

Height of Drawbar	19.5 in (493 mm)	19.5 in (493 mm)
Static Weight with Operator—Rear	11530 lb (5239 kg)	10685 lb (4847 kg)

—Front	5610 lb (2537 kg)	5495 lb (2485 kg)
—Total	14940 lb (6776 kg)	14180 lb (6422 kg)

THREE POINT Hitch PERFORMANCE

Observed Maximum Pressure psi (kPa)	2225	15140
Location	remote	

Hydraulic oil temperature °F (°C)	172	78
Location	sump	

QUICK ATTACH CATEGORY	00	11
LOAD lbs (kg)	6604	2996

TIME sec	2.44	
HITCH POINT MOVEMENT in (mm)		

Lowest position	12.0	305
Top of timed range	36.0	914

Highest position	36.0	914
LOAD CG MOVEMENT in (mm)		

Lowest position	10.5	267
Top of timed range	42.0	1067

Highest position	42.1	1070
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Implement load capacity for transport purposes not specified by manufacturer		
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surface without brake) right 362" (9.20 m) left 362" (9.20 m) Power take-off 534 rpm at 2100 engine rpm and 998 rpm at 2100 engine rpm Unladen tractor mass 12155 lb (5514 kg)

REPAIRS AND ADJUSTMENTS: During the hydraulic lift test the control valve linkage was adjusted.

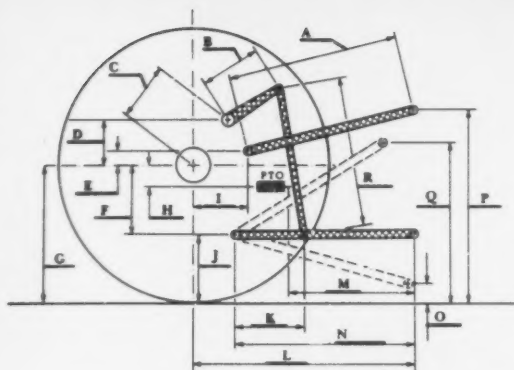
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 123°F (50.5°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1549, December 10, 1984.

Report issued. Supplemental sales permit for Case International 2096 Powershift Diesel June 18, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	22.5	572
B	12.0	305
C	14.7	372
D	13.0	330
E	6.2	157
F	12.4	315
G	31.7	805
H	0.2	5
I	20.2	512
J	19.3	490
K	17.1	434
L	42.7	1084
M	20.7	525
N	30.2	766
O	8.0	203
P	38.3	973
Q	33.5	845
R	34.5	876



Case 2096 Powershift Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omstedt, Dean and Director

NEBRASKA TRACTOR TEST 1582 CASE INTERNATIONAL 2394 POWERSHIFT DIESEL 24 SPEED ALSO 12 SPEED CHASSIS SERIAL NUMBERS 9939480 AND HIGHER

Department of Agricultural Engineering

Dates of Test: October 16 to 28, 1985

Manufacturer: J.I. CASE COMPANY, 700 State Street, Racine, Wisconsin 53404

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)				Barometer mch Hg (kPa)
		gal/hr (L/h)	B/hp-hr (g/kW-h)	Hp-hr/gal (kW-h/k)	Cooling medium	wet bulb	air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed — Two hours (PTO Speed—1002 rpm)									
162.92	2100	10.504	0.444	15.81	180	64	76	29.05	

VARYING POWER AND FUEL CONSUMPTION — Two Hours

142.23 (106.06)	2157	9.513 (35.252)	0.459 (0.279)	15.27 (3.009)	186 (85.3)	64 (17.8)	75 (23.9)		
0.00 (0.00)	2299	2.922 (11.060)	—	—	178 (81.1)	62 (16.7)	74 (23.1)		
75.45 (54.78)	2228	5.831 (22.071)	0.557 (0.339)	12.60 (2.482)	181 (82.8)	62 (16.7)	74 (23.1)		
162.40 (121.10)	2100	10.241 (38.766)	0.442 (0.269)	15.86 (3.124)	189 (87.2)	52 (16.7)	76 (24.2)		
57.27 (27.79)	2261	4.419 (16.727)	0.832 (0.506)	8.43 (1.661)	180 (81.9)	62 (16.7)	76 (24.2)		
108.35 (80.79)	2191	7.486 (28.118)	0.485 (0.295)	14.47 (2.851)	183 (83.9)	65 (17.2)	75 (23.9)		
Av 87.28 (65.09)	2206	6.702 (25.369)	0.538 (0.328)	13.02 (2.566)	183 (83.7)	63 (16.9)	75 (23.8)	29.00 (97.93)	

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)				Barom. mch Hg (kPa)
					gal/hr (L/h)	B/hp-hr (g/kW-h)	Hp-hr/gal (kW-h/k)	Cool- ing med	Air wet bulb	Air dry bulb		
Maximum Available Power — Two Hours 12th (3-2) Gear												
145.56 (108.54)	10849 (47.37)	5.13 (8.25)	2100	3.02	10.138 (38.378)	0.488 (0.297)	14.36 (2.826)	191 (88.3)	65 (18.3)	74 (23.1)	28.65 (98.66)	
75% of Pull at Maximum Power — Ten Hours 12th (3-2) Gear												
117.06 (87.29)	8184 (36.40)	5.36 (8.63)	2181	2.25	8.635 (32.688)	0.517 (0.315)	15.56 (2.670)	187 (86.2)	54 (12.2)	68 (19.9)	29.06 (98.11)	
50% of Pull at Maximum Power — Two Hours 12th (3-2) Gear												
79.71 (59.44)	5456 (24.27)	5.48 (8.82)	2210	1.45	6.702 (25.369)	0.590 (0.359)	11.89 (2.343)	186 (85.3)	65 (18.1)	74 (23.1)	28.60 (98.20)	
50% of Pull at Reduced Engine Speed — Two Hours 16th (3-4) Gear												
79.74 (59.48)	5456 (24.27)	5.48 (8.82)	1661	1.45	5.604 (21.213)	0.493 (0.308)	14.23 (2.803)	185 (85.0)	57 (10.8)	62 (16.7)	29.08 (98.20)	

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8423 Fuel weight 7.013 lbs/gal (0.840 kg/l) Oil Case Enginegard SAE 30 API service classification CD/SE To motor 6.769 gal (25.624 l) Drained from motor 6.459 gal (24.449 l) Transmission and final drive lubricant Case Powergard PTF transmission fluid Total time engine was operated 38.0 hours.

ENGINE: Make Case Diesel Type six cylinder vertical with turbocharger Serial No. *1056623* Crankshaft lengthwise Rated rpm 2100 Bore and stroke 4.625" x 5.00" (117.5 mm x 127 mm) Compression ratio 15.8 to 1 Displacement 504 cu in (8259 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter two full flow cartridges Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper cartridges and prestrainer Muffler vertical Cooling medium temperature control two thermostats.

CHASSIS: Type standard with duals Serial No. *9939481* Tread width rear 64" (1626 mm) to 134 (3404 mm) front 61" (1549 mm) to 89" (2261 mm) Wheel base 118" (2997 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 27.5" (700 mm) Vertical distance above roadway 40.7" (1034 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (6) range operator controlled powershift Advertised speeds mph (km/h) first 1.9 (3.0) second 2.1 (3.4) third 2.5 (4.0) fourth 2.9 (4.6) fifth 3.1 (5.0) sixth 3.2 (5.2) seventh 3.6 (5.8) eighth 3.7 (6.0) ninth 4.3 (6.9) tenth 4.4 (7.0) eleventh 4.9 (7.9) twelfth 5.0 (8.1) thirteenth 5.4 (8.6) fourteenth 5.8 (9.4) fifteenth 6.2 (9.9) sixteenth 6.7 (10.8) seventeenth 7.3 (11.7) eighteenth 8.4 (13.5) nineteenth 10.4 (16.7) twentieth 11.9 (19.1) twenty-first 13.8 (22.2) twenty-second 15.9 (25.5) twenty-third 17.2 (27.7) twenty-fourth 20.8 (33.5) reverse 3.1 (5.0), 5.4 (8.6), 7.3 (11.7) Clutch wet multiple disc hydraulically power actuated by foot pedal Brakes wet multiple disc hydraulically power actuated by two foot pedals which can be locked

MAXIMUM POWER IN SELECTED GEARS

131.90	17425	2.84	2123	13.87	5th (1.5:1) Gear	186	45	48	28.99
(98.16)	(77.51)	(4.57)				(45.3)	(12.2)	(8.9)	(97.89)
138.94	17142	3.04	2102	9.99	6th (2:1) Gear	186	47	53	29.02
(101.60)	(76.25)	(4.89)				(45.6)	(8.1)	(11.7)	(98.00)
146.01	15586	3.56	2100	3.43	7th (1.6:1) Gear	186	59	62	28.76
(108.88)	(68.44)	(5.71)				(45.6)	(15.0)	(16.7)	(97.12)
147.33	14965	3.69	2098	5.11	8th (2:2) Gear	186	59	65	28.74
(109.82)	(66.57)	(5.94)				(45.6)	(15.0)	(17.2)	(97.05)
147.25	12744	4.53	2100	3.69	9th (2:3) Gear	187	60	64	28.75
(109.80)	(56.69)	(6.92)				(45.6)	(15.6)	(17.8)	(97.02)
147.84	12565	4.41	2101	3.69	10th (3:1) Gear	188	60	65	28.72
(110.24)	(55.89)	(7.10)				(46.7)	(15.6)	(18.1)	(96.96)
148.38	11045	5.04	2101	2.95	11th (2:4) Gear	189	60	66	28.71
(110.65)	(49.72)	(8.11)				(46.9)	(15.6)	(18.9)	(96.95)
148.98	10912	5.12	2098	2.95	12th (3:2) Gear	189	60	67	28.70
(111.10)	(48.54)	(8.24)				(47.2)	(15.6)	(19.6)	(96.92)
147.83	10130	5.47	2098	2.76	13th (2:3) Gear	189	61	68	28.69
(110.24)	(45.06)	(8.81)				(47.2)	(16.1)	(20.0)	(96.88)
147.08	9282	5.95	2099	2.41	14th (5:3) Gear	190	62	69	28.68
(109.66)	(41.20)	(9.58)				(47.5)	(16.7)	(20.6)	(96.85)
146.82	8685	6.34	2098	2.24	15th (2:6) Gear	189	63	70	28.68
(109.99)	(38.61)	(10.20)				(47.2)	(17.2)	(21.1)	(96.85)
146.43	7955	6.90	2101	2.07	16th (3:4) Gear	190	65	73	28.66
(109.19)	(35.18)	(11.11)				(47.5)	(18.1)	(22.8)	(96.78)
144.67	7246	7.49	2098	1.80	17th (3:5) Gear	190	65	72	28.67
(107.88)	(32.21)	(12.05)				(47.8)	(18.1)	(22.2)	(96.81)
144.28	6243	8.67	2100	1.54	18th (3:6) Gear	189	65	71	28.67
(107.59)	(27.77)	(13.95)				(47.2)	(18.1)	(21.7)	(96.81)

LUGGING ABILITY IN 12th (3:2) GEAR

Crankshaft Speed rpm	2098	1892	1663	1470	1256	1048
Pull—lb (kg)	10912 (48.54)	11857 (53.65)	12566 (55.02)	12456 (55.41)	12166 (54.13)	11257 (50.07)
Increase in Pull %	0	8	13	14	12	5
Power—Hp (kW)	148.98 (111.10)	145.27 (108.31)	154.62 (100.19)	118.40 (88.29)	98.91 (73.76)	76.61 (57.12)
Speed—Mph (km/h)	5.12 (8.24)	4.60 (7.41)	4.08 (6.57)	3.56 (5.74)	3.05 (4.91)	2.55 (4.11)
Slip %	2.93	3.10	3.44	5.61	3.44	3.10

TRACTOR SOUND LEVEL WITH CAB	dBA(A)
Maximum Available Power—Two Hours	75.5
75% of Pull at Maximum Power—Ten Hours	75.5
50% of Pull at Maximum Power—Two Hours	76.0
50% of Pull at Reduced Engine Speed—Two Hours	75.0
Bystander in 23rd (4:5) gear	87.0

TIRES, BALLAST AND WEIGHT	With Ballast	Without Ballast
Rear Tires	—No. size, ply & psi (kPa) Four 20.8R34, 8, inner 16 (110 outer 12 (85)) —Liquat (track inner) —Cast Iron (track) —None	Four 20.8R34, 8, inner 16 (110 outer 12 (85)) —None —None
Front Tires	—No. size, ply & psi (kPa) —Liquat (track) —Cast Iron (track)	Two 14L-16.1, 10, 44 (105) —None —None
Height of Drawbar	20.5 in (520 mm)	20.5 in (520 mm)
Static Weight with Operator—Bare	14630 lb (6636 kg)	12650 lb (5734 kg)
—Front	4000 lb (1814 kg)	3750 lb (1701 kg)
—Total	18630 lb (8450 kg)	16400 lb (7439 kg)

together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 163.8" (4.16 m) left 163.8" (4.16 m) (on concrete surface without brake) right 184.5" (4.69 m) left 184.5" (4.69 m) Turning space diameter (on concrete surface with brake applied) right 342" (8.69 m) left 342" (8.69 m) (on concrete surface without brake) right 388.8" (9.88 m) left 388.8" (9.88 m) Power take-off 1002 rpm at 2100 engine rpm Unladen tractor mass 13970 lb (6337 kg)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 156°F (68.9°C). Fourteen gears were chosen between 15% slip and 10 mph (16.1 km/h). The performance figures on this report apply to tractor chassis Serial No. 104-00331 and higher.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1582, December 5, 1985.

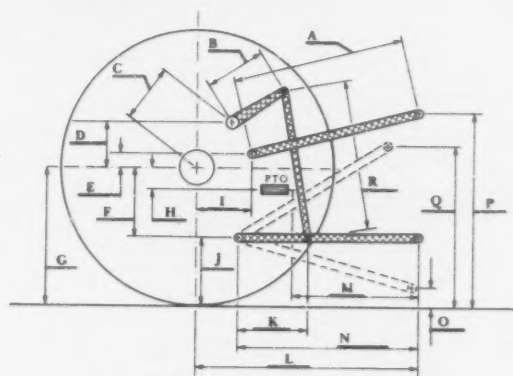
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2225 (15340)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	130 (66)	
Location	transmission drain plug	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	yes	
CATEGORY	III	*not measured
LOAD lbs (kg)	7758 (3519)	
TIME sec	2.34	
HITCH POINT MOVEMENT (in (mm))		
Lowest position	9.9 (251)	
Top of timed range	35.9 (912)	
Highest position	40.5 (1024)	
LOAD CG MOVEMENT (in (mm))		
Lowest position	9.7 (246)	
Top of timed range	39.2 (996)	
Highest position	46.0 (1168)	

*Implement load capacity for transport purposes not specified by manufacturer



Hitch Dimensions as Tested — No Load

	inch	mm
A	23.5	597
B	11.4	289
C	11.5	293
D	1.9	48
E	7.7	196
F	12.7	322
G	33.2	843
H	6.0	152
I	21.9	557
J	20.5	521
K	17.4	441
L	45.8	1163
L'	49.8	1265
M	21.1	536
N	35.4	899
O	8.0	203
P	42.6	1082
Q	42.1	1070
R	20.8	527

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Case International 2394 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Irvin T. Ostved, Dean and Director

NEBRASKA TRACTOR TEST 1583 CASE INTERNATIONAL 3394 POWERSHIFT DIESEL 24 SPEED ALSO 12 SPEED

Department of Agricultural Engineering

Dates of Test: October 15 to 24, 1985

Manufacturer: J.I. CASE COMPANY, 700 State Street, Racine, Wisconsin 53404

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption				Temperature °F (°C)				Barometer in. Hg (kPa)
		gal/hr (lit)	Bhp/hr (kg 98% h)	Hp/hr gal (98% h)	Cooling medium	Cool- ant temp bulb	Air wet bulb	Air dry bulb		

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed — 1002 rpm)										
162.86 (121.45)	2100	10.585 (40.067)	0.456 (0.277)	15.59 (3.011)	189 (88.9)	63 (17.3)	75 (23.9)	28.95 (97.69)		

VARYING POWER AND FUEL CONSUMPTION — Two Hours

141.73 (105.68)	2150	9.544 (36.127)	0.472 (0.287)	14.85 (2.925)	185 (85.0)	64 (17.5)	74 (21.3)	—		
0.00 (0.00)	2294	5.106 (11.756)	—	—	174 (78.9)	64 (17.8)	75 (22.8)	—		
75.42 (54.75)	2229	6.070 (22.976)	0.580 (0.353)	12.10 (2.383)	180 (82.2)	64 (17.8)	74 (23.3)	—		
105.54 (77.84)	2100	10.485 (39.689)	0.450 (0.275)	15.50 (3.073)	189 (87.2)	65 (18.3)	77 (24.7)	—		
57.55 (42.84)	2265	4.658 (17.646)	0.875 (0.532)	8.01 (1.576)	176 (80.0)	65 (18.1)	76 (24.6)	—		
108.55 (80.80)	2191	7.807 (29.352)	0.505 (0.307)	15.88 (2.734)	183 (83.6)	65 (18.3)	75 (21.9)	—		
Av 87.40 (65.18)	2204	6.945 (26.290)	0.557 (0.335)	12.50 (2.479)	181 (82.8)	64 (18.0)	75 (23.8)	28.96 (97.79)		

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption				Temp °F (°C)				Barom. in. Hg (kPa)
					gal/hr (lit)	Bhp/hr (kg 98% h)	Hp/hr gal (98% h)	Cool- ant temp bulb	Air wet bulb	Air dry bulb			

Maximum Available Power — Two Hours 16th (5-4) Gear													
181.17 (133.27)	7692	6.88 (14.22)	2100	2.83 (11.08)	10.452 (39.565)	2.519 (0.316)	13.51 (2.861)	189 (86.9)	59 (14.7)	64 (17.8)	28.96 (97.69)		

75% of Pull at Maximum Power — Ten Hours 16th (5-4) Gear													
112.49 (83.88)	5900	7.15 (26.24)	2165	2.05 (11.51)	9.010 (34.108)	0.582 (0.342)	12.48 (2.459)	187 (86.1)	54 (12.2)	66 (19.1)	28.73 (97.00)		

50% of Pull at Maximum Power — Two Hours 16th (5-4) Gear													
76.66 (57.16)	3915	7.34 (17.81)	2211	1.92 (11.82)	7.265 (27.301)	0.665 (0.406)	10.55 (2.079)	182 (83.3)	50 (13.3)	57 (13.6)	28.98 (97.84)		

50% of Pull at Reduced Engine Speed — Two Hours 16th (5-4) Gear													
76.61 (57.13)	3914	7.34 (17.81)	1786	1.39 (11.81)	6.101 (23.398)	0.566 (0.344)	12.39 (2.462)	183 (83.6)	55 (12.5)	56 (13.1)	28.95 (97.79)		

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8425 Fuel weight 7.015 lb/gal (0.840 kg/l) Oil Case Enginegard SAE 50 API service classification CD/SE To motor 5.290 gal (19.988 l) Drained from motor 4.819 gal (18.240 l) Transmission and hydraulic lubricant Case Powergard PTF transmission fluid Front seal lubricant Case Loadgard-GL5 85W140EP gear lubricant Total time engine was operated 32.0 hours.

ENGINE: Make Case Diesel Type six cylinder vertical with turbocharger Serial No. *10365824* Crankshaft lengthwise Rated rpm 2100 Bore and stroke 4.625" x 5.00" (117.5 mm x 127 mm) Compression ratio 15.8 to 1 Displacement 504 cu in (8259 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter two full flow cartridges Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper cartridges and prestrainer Muffler vertical Cooling medium temperature control two thermostats.

CHASSIS: Type all wheel drive with constant mesh front axle Serial No. *9938917* Tread width rear 64" (1626 mm) to 110" (2794 mm) front 60" (1524 mm) to 88" (2235 mm) Wheel base 110" (2946 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 38.4" (976 mm) Vertical distance above roadway 38.0" (965 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (6) range operator controlled powershift Advertised speeds mph (km/h) first 1.9 (3.0) second 2.1 (3.4) third 2.5 (4.0) fourth 2.9 (4.6) fifth 3.1 (5.0) sixth 3.2 (5.2) seventh 3.6 (5.8) eighth 3.7 (6.0) ninth 4.3 (6.9) tenth 4.4 (7.0) eleventh 4.9 (7.9) twelfth 5.0 (8.1) thirteenth 5.4 (8.6) fourteenth 5.8 (9.4) fifteenth 6.2 (9.9) sixteenth 6.7 (10.8) seventeenth 7.5 (11.7) eighteenth 8.4 (13.5) nineteenth 10.4 (16.7) twentieth 11.9 (19.1) twenty-first 13.8 (22.2) twenty-second 15.9 (25.5) twenty-third 17.2 (27.7) twenty-fourth 20.8 (33.3) reverse 3.1 (5.0), 5.4 (8.6), 7.5 (11.7) Clutch wet multiple disc hydraulically power actuated by foot pedal Brakes wet multiple disc

MAXIMUM POWER IN SELECTED GEARS

122.11 (91.05)	17421	2.65 (4.23)	2150	14.64 (44.4)	6th (1-4) Gear	184 (84.4)	54 (12.2)	55 (12.8)	29.01 (97.96)
130.20 (97.09)	17505	2.82 (4.34)	2102	13.97 (40.7)	5th (1-5) Gear	185 (84.7)	54 (12.2)	55 (12.8)	29.01 (97.96)
135.66 (101.16)	16014	3.01 (7.24)	2101	11.47 (4.84)	6th (5-1) Gear	185 (85.0)	54 (12.2)	55 (12.8)	29.02 (98.00)
140.95 (103.11)	15191	3.48 (6.77)	2100	7.97 (5.86)	7th (1-6) Gear	185 (85.0)	56 (12.8)	56 (13.1)	29.02 (98.00)
142.58 (106.18)	14727	3.65 (6.51)	2100	7.35 (5.84)	8th (2-2) Gear	185 (85.0)	55 (12.8)	58 (14.4)	29.05 (98.01)
142.55 (106.28)	12495	4.28 (5.57)	2100	5.51 (6.89)	9th (2-3) Gear	186 (85.6)	56 (12.8)	58 (14.4)	29.03 (98.48)
143.27 (106.83)	12325	4.56 (5.82)	2100	5.43 (7.02)	10th (3-1) Gear	186 (85.3)	55 (12.8)	58 (14.4)	29.05 (98.01)
144.39 (107.67)	10852	4.99 (6.27)	2100	4.44 (8.03)	11th (3-4) Gear	186 (85.6)	55 (12.8)	58 (14.4)	29.05 (98.01)
144.82 (107.99)	10687	5.08 (6.74)	2100	4.27 (8.18)	12th (3-2) Gear	186 (85.3)	56 (13.1)	59 (15.0)	29.05 (98.01)
143.83 (107.25)	0991	5.44 (6.13)	2099	3.94 (8.75)	13th (3-3) Gear	187 (85.8)	56 (13.1)	59 (15.0)	29.03 (98.01)
143.08 (106.70)	0632	5.95 (6.27)	2101	3.43 (9.34)	14th (3-3) Gear	187 (86.1)	56 (13.1)	59 (15.0)	29.03 (98.01)
143.14 (106.74)	0498	6.32 (7.80)	2100	3.09 (10.17)	15th (3-4) Gear	187 (85.8)	56 (13.1)	60 (15.8)	29.03 (98.01)
144.29 (107.60)	7860	6.80 (8.49)	2099	2.74 (11.07)	16th (3-4) Gear	189 (87.2)	58 (14.4)	64 (17.8)	29.06 (97.79)
141.08 (103.20)	7070	7.47 (31.49)	2100	2.57 (12.03)	17th (3-5) Gear	187 (86.1)	57 (13.9)	61 (18.1)	29.05 (98.00)
139.69 (104.17)	0836	8.65 (26.94)	2098	2.19 (13.92)	18th (3-6) Gear	187 (86.1)	56 (13.1)	61 (18.1)	29.03 (98.01)

LUGGING ABILITY IN 16th (3-4) GEAR

Crankshaft Speed rpm	2099	1889	1680	1475	1267	1052
Pull—lb (kN)	7860 (34.99)	6587 (29.20)	5080 (22.80)	3833 (17.00)	3067 (13.82)	2390 (10.82)
Increase in Pull %	0	9	15	19	18	0
Power—Hp (kW)	144.29 (107.60)	140.99 (105.13)	132.28 (98.64)	119.55 (89.13)	101.75 (75.87)	78.57 (58.39)
Speed—Mph (km/h)	6.88 (11.07)	6.16 (9.91)	5.47 (8.80)	4.79 (7.71)	4.12 (6.63)	3.45 (5.51)
Slip %	2.74	3.26	3.26	3.43	5.43	3.20

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours	75.0
75% of Pull at Maximum Power—Ten Hours	74.0
50% of Pull at Maximum Power—Two Hours	75.5
50% of Pull at Reduced Engine Speed—Two Hours	75.0
Bystander in 23rd (4-5) gear	68.0

Tires, Ballast and Weight

Base Tires	With Ballast		Without Ballast
	—No. cur. ply & psi (kPa)	—225 lb (102 kg)	
Ballast	—Liquid (each)	225 lb (102 kg)	None
	—Cast Iron (each)	None	None
Front Tires	With Ballast		Without Ballast
	—No. cur. ply & psi (kPa)	Two 16.9-28, 10.28 (195)	
Ballast	—Liquid (each)	685 lb (311 kg)	None
	—Cast Iron (each)	495 lb (224 kg)	None
Height of Drawbar			
	22.3 in (570 mm)	22.5 in (570 mm)	
Basic Weight with Operator—Rear			
	11150 lb (5057 kg)	10700 lb (4854 kg)	
	—Front	7480 lb (3394 kg)	5100 lb (2311 kg)
	—Total	18630 lb (8444 kg)	15800 lb (7167 kg)

hydraulically power actuated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 173" (4.39 m) left 173" (4.39 m) (on concrete surface without brake) right 233" (5.92 m) left 233" (5.92 m) Turning space diameter (on concrete surface with brake applied) right 364" (9.23 m) left 364" (9.23 m) (on concrete surface without brake) right 486" (12.34 m) left 486" (12.34 m) Power take-off 1002 rpm at 2100 engine rpm Unladen tractor mass 15620 lb (7083 kg)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 156°F (68.9°C). Fifteen gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1583, December 3, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

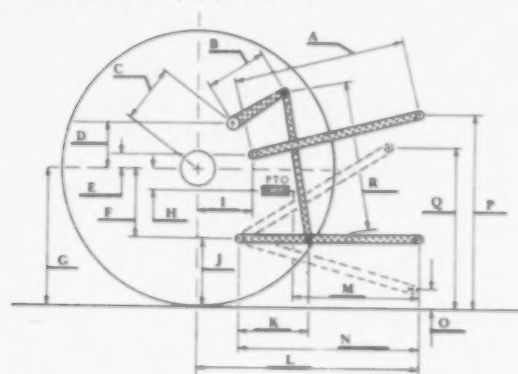
K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure (psi) (kPa)	2500 (17240)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	154 (68)	
Location	transmission drain plug	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	III	*not measured
LOAD (lbs (kg))	7732 (3506)	
TIME sec	2.05	
HITCH POINT MOVEMENT in (mm)		
Lowest position	9.7 (246)	
Top of timed range	15.7 (400)	
Highest position	40.0 (1016)	
LOAD CG MOVEMENT in (mm)		
Lowest position	9.4 (239)	
Top of timed range	18.4 (466)	
Highest position	45.9 (1166)	

*Implement load capacity for transport purposes not specified by manufacturer



Hitch Dimensions as Tested — No Load

	in (mm)	mm
A	23.5	591
B	11.4	289
C	11.3	293
D	1.9	48
E	7.7	196
F	12.7	322
G	32.8	833
H	6.0	152
I	21.9	557
J	20.1	511
K	17.4	441
L	45.8	1163
M	49.8	1265
N	21.1	536
O	35.4	899
P	7.9	200
Q	42.2	1073
R	40.4	1026
S	20.8	527

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Case International 3594 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Ousterhout, Dean and Director

NEBRASKA TRACTOR TEST 1584

CASE INTERNATIONAL 3594 POWERSHIFT DIESEL

24 SPEED ALSO 12 SPEED

Department of Agricultural Engineering

Dates of Test: October 16 to 31, 1985

Manufacturer: J.I. CASE COMPANY, 700 State Street, Racine, Wisconsin 53404

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60/68°F (15/15°C) 0.8421 Fuel weight 7.012 lbs/gal (0.840 kg/l) Oil Case Enginegard SAE 30 API service classification CD/SE To motor 5.204 gal (19.698 l) Drained from motor 4.873 gal (18.447 l) Transmission and hydraulic lubricant Case Powergard PTF transmission fluid Front axle lubricant Case Loadgard-GLS 85W140EP gear lubricant Total time engine was operated 45.5 hours.

ENGINE: Make Case Diesel Type six cylinder vertical with turboscharger Serial No. *10365398* Crankshaft lengthwise Rated rpm 2100 Bore and stroke 4.625" x 5.00" (117.3 mm x 127 mm) Compression ratio 15.8 to 1 Displacement 504 cu in (8239 cc) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter two full flow cartridges Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper cartridges and prestrainer Muffler vertical Cooling medium temperature control two thermostats.

CHASSIS: Type all wheel drive with rear dual and constant mesh front axle Serial No. *9859036* Tread width rear 64" (1626 mm) to 134" (3404 mm) front 60" (1524 mm) to 89" (2261 mm) Wheel base 116" (2946 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 34.0" (864 mm) Vertical distance above roadway 38.0" (965 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (6) range operator controlled powershift Adversity speeds mph (km/h) first 1.9 (3.0) second 2.1 (3.4) third 2.5 (4.0) fourth 2.9 (4.6) fifth 3.1 (5.0) sixth 3.2 (5.2) seventh 3.6 (5.8) eighth 3.7 (6.0) ninth 4.3 (6.9) tenth 4.4 (7.0) eleventh 4.9 (7.9) twelfth 5.0 (8.1) thirteenth 5.4 (8.6) fourteenth 5.8 (9.4) fifteenth 6.2 (9.9) sixteenth 6.7 (10.7) seventeenth 7.5 (11.7) eighteenth 8.4 (13.3) nineteenth 10.4 (16.7) twentieth 11.9 (19.1) twenty-first 13.8 (22.2) twenty-second 15.9 (25.5) twenty-third 17.2 (27.7) twenty-fourth 20.8 (33.3) reverse 3.1 (5.0), 5.4 (8.6), 7.5 (11.7) Clutch wet multiple disc

POWER TAKE-OFF PERFORMANCE

Power Hhp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/hr)	Relp. hp (kg/100 h)	Hp to gal (kW h)	Cooling medium	Air wet bulb	Air dry bulb	Recovery inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed — 1000 rpm)								
182.27 (135.82)	2100	11.800 (44.667)	0.454 (0.276)	15.45 (3.063)	196 (89.8)	60 (15.4)	75 (24.1)	28.75 (97.07)
VARYING POWER AND FUEL CONSUMPTION — Two Hours								
160.42 (119.62)	2174	10.002 (40.132)	0.465 (0.282)	15.13 (2.983)	187 (86.2)	57 (13.9)	75 (23.6)	—
0.00 (0.00)	2294	2.982 (11.288)	—	—	176 (80.0)	56 (13.3)	71 (21.7)	—
85.01 (61.80)	2254	6.572 (24.876)	0.555 (0.338)	12.65 (2.488)	180 (81.9)	57 (13.6)	79 (23.8)	—
182.79 (136.11)	2100	11.808 (44.696)	0.455 (0.276)	15.48 (3.049)	191 (88.1)	56 (13.3)	76 (24.4)	—
41.86 (31.22)	2272	4.728 (17.898)	0.792 (0.482)	8.86 (1.744)	165 (85.6)	55 (12.8)	75 (21.8)	—
122.86 (90.61)	2221	8.595 (32.537)	0.491 (0.298)	14.29 (2.816)	185 (85.9)	55 (12.8)	76 (24.2)	—
Av (71.45)	2210	7.540 (28.571)	0.537 (0.327)	13.85 (2.571)	183 (83.3)	56 (13.3)	75 (23.8)	28.75 (97.02)

DRAWBAR PERFORMANCE

Power Hhp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Relp. hp (kg/100 h)	Hp to gal (kW h)	Cool- ing med	Air wet bulb	Air dry bulb	Recovery inch Hg (kPa)
Maximum Available Power — Two Hours 10th (5-6) Gear											
180.59 (139.60)	8968	6.94 (11.17)	2100	2.19	11.708 (44.321)	0.512 (0.311)	13.70 (2.699)	170 (87.5)	55 (11.7)	61 (16.1)	29.00 (98.00)
75% of Pull at Maximum Power — Ten Hours 10th (5-6) Gear											
129.20 (96.35)	6621	7.32 (11.78)	2202	1.74	10.010 (37.892)	0.545 (0.338)	12.91 (2.545)	187 (85.8)	50 (10.0)	62 (16.4)	29.00 (98.00)
50% of Pull at Maximum Power — Two Hours 10th (5-6) Gear											
80.50 (60.66)	4414	7.30 (11.77)	2265	1.51	7.806 (29.654)	0.620 (0.381)	11.30 (2.208)	191 (84.4)	47 (8.3)	52 (11.1)	29.00 (98.00)
50% of Pull at Reduced Engine Speed — Two Hours 10th (5-6) Gear											
88.42 (65.85)	4413	7.51 (12.03)	1800	1.26	6.787 (25.426)	0.557 (0.326)	13.07 (2.574)	184 (84.6)	51 (10.0)	60 (15.8)	29.00 (98.00)

MAXIMUM POWER IN SELECTED GEARS

145.08	20384	2.67	5155	14.12	4th (1-4) Gear	184	57	40	29.08
(108.19)	(90.57)	(4.30)				(84.2)	(2.8)	(1.4)	(98.20)
155.27	19944	2.92	2099	11.11	5th (1-5) Gear	185	43	46	29.02
(115.29)	(88.71)	(4.70)				(85.0)	(6.1)	(7.8)	(98.00)
160.80	19280	5.15	2101	8.28	6th (2-1) Gear	186	44	48	29.05
(119.91)	(85.76)	(5.01)				(85.3)	(6.7)	(8.9)	(98.10)
162.18	16964	5.59	2102	5.50	7th (1-6) Gear	189	54	75	29.08
(120.94)	(75.46)	(5.77)				(87.2)	(12.2)	(21.6)	(98.20)
163.28	16465	5.72	2099	5.35	8th (2-2) Gear	189	54	74	29.08
(121.76)	(71.21)	(5.99)				(87.2)	(12.2)	(21.3)	(98.20)
163.35	14044	4.56	2100	4.08	9th (2-3) Gear	191	55	75	29.07
(121.79)	(62.47)	(7.02)				(88.3)	(12.8)	(22.8)	(98.17)
164.57	13890	4.44	2100	3.92	10th (5-1) Gear	191	56	72	29.07
(122.57)	(61.78)	(7.14)				(88.1)	(13.1)	(22.2)	(98.17)
165.12	12220	5.07	2100	3.52	11th (2-4) Gear	195	56	72	29.07
(121.13)	(54.16)	(8.15)				(87.5)	(11.1)	(22.2)	(98.17)
164.99	12008	5.15	2099	5.25	12th (5-2) Gear	190	56	72	29.07
(121.01)	(51.41)	(8.29)				(87.8)	(11.1)	(22.2)	(98.17)
164.29	11190	5.51	2098	2.89	13th (2-5) Gear	190	55	72	29.07
(122.51)	(49.78)	(9.86)				(87.8)	(12.8)	(22.2)	(98.17)
163.41	10225	5.99	2100	2.65	14th (5-3) Gear	192	55	72	29.07
(121.83)	(45.47)	(9.81)				(88.6)	(12.8)	(22.2)	(98.17)
165.44	9592	6.39	2101	2.57	15th (2-6) Gear	191	55	72	29.08
(121.88)	(42.47)	(10.28)				(88.3)	(12.8)	(22.2)	(98.20)
165.52	8828	6.95	2100	2.19	16th (5-4) Gear	192	56	72	29.09
(121.94)	(39.27)	(11.18)				(88.6)	(13.1)	(22.2)	(98.21)
161.82	8045	7.54	2100	2.11	17th (5-5) Gear	191	56	72	29.09
(120.67)	(35.28)	(12.14)				(88.1)	(13.1)	(22.2)	(98.21)
159.55	6852	8.72	2099	1.58	18th (5-6) Gear	191	55	72	29.08
(118.83)	(30.48)	(14.04)				(88.3)	(12.8)	(22.2)	(98.20)

LUGGING ABILITY IN 16th (5-4) GEAR

Crankshaft Speed rpm	2100	1892	1672	1474	1257	1059
Pull—lb	8028	9795	10452	10630	10255	9210
(36)	(19.27)	(41.36)	(46.40)	(47.28)	(45.31)	(40.97)
Increase in Pull %	0	11	18	20	16	4
Power—hp	163.52	162.95	155.05	157.45	112.96	85.84
(69)	(121.94)	(121.50)	(114.11)	(102.49)	(84.21)	(64.01)
Speed—mph	6.95	6.24	5.50	4.85	4.14	3.49
(11.8)	(11.18)	(10.04)	(8.87)	(7.89)	(6.66)	(5.62)
Slip %	2.19	2.54	2.54	2.89	2.72	2.54

TRACTOR SOUND LEVEL WITH CAB	dB(A)
Maximum Available Power—Two Hours	77.0
75% of Pull at Maximum Power—Ten Hours	76.0
50% of Pull at Maximum Power—Two Hours	76.5
50% of Pull at Reduced Engine Speed—Two Hours	74.5
Bystander in 23rd (4-5) gear	88.5

TIRES, BALLAST AND WEIGHT

Rear Tires	—No., size, ply & psi (kPa)	Four 20 RR38, 8, meter 10 (110) meter 12 (85)	Four 20 RR38, 8, meter 16 (110) meter 12 (85)
Ballast	—Liquid (each)	None	None
—Tire equip. (each)	8 lb (3.6 kg)	None	None
Front Tires	—No., size, ply & psi (kPa)	Two 16.9-28, 10, 28 (195)	Two 16.9-28, 10, 28 (195)
Ballast	—Liquid (each)	688 lb (312 kg)	None
—Cast iron (each)	752 lb (341 kg)	None	None
Height of Drawbar		25 in (585 mm)	25 in (585 mm)
Static Weight with Operator—Rear		12520 lb (5679 kg)	12490 lb (5666 kg)
—Front		7080 lb (3200 kg)	5100 lb (2311 kg)
—Total		20500 lb (9299 kg)	17590 lb (7979 kg)

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Irvin T. Omtvedt, Dean and Director

hydraulically power actuated by foot pedal **Brakes** wet multiple disc hydraulically power actuated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 173" (4.39 m) left 173" (4.39 m) (on concrete surface without brake) right 233" (5.92 m) left 233" (5.92 m) **Turning space diameter** (on concrete surface with brake applied) right 364" (9.25 m) left 364" (9.25 m) (on concrete surface without brake) right 486" (12.34 m) left 486" (12.34 m) **Power take-off** 1000 rpm at 2100 engine rpm **Unladen tractor mass** 15620 lb (7085 kg).

REPAIRS AND ADJUSTMENTS: During preliminary PTO test, the PTO control cable broke. The cable was replaced at end of tests.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 162°F (72.2°C). Fifteen gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1584, December 5, 1985.

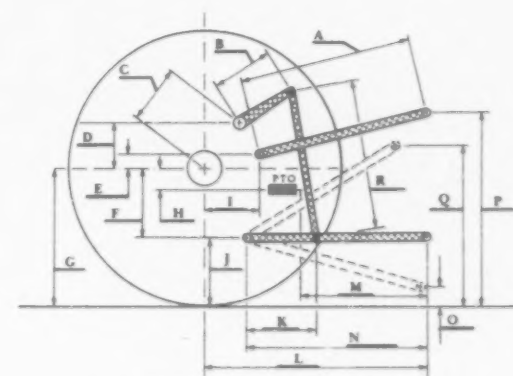
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2250 (155.0)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	157 (69)	
Location	transmission drain plug	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	yes	
CATEGORY	III	*not measured
LOAD lbs (kg)	7738 (3519)	
TIME sec	1.95	
HITCH POINT MOVEMENT in (mm)		
Lowest position	9.9 (251)	
Top of timed range	53.9 (912)	
Highest position	40.2 (1021)	
LOAD CG MOVEMENT in (mm)		
Lowest position	10.0 (254)	
Top of timed range	59.3 (998)	
Highest position	46.0 (1168)	

*Impington load capacity for transport purposes not specified by manufacturer



Hitch Dimensions as Tested — No Load

	in	mm
A	25.5	597
B	11.4	289
C	11.5	293
D	1.9	48
E	7.7	196
F	12.7	323
G	55.9	1420
H	6.0	152
I	21.9	557
J	21.5	546
K	17.4	441
L	45.8	1163
M	49.8	1265
N	21.1	536
O	35.4	899
P	8.0	203
Q	43.4	1101
R	40.6	1032
S	21.9	556

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Case International 3594 Diesel

NEBRASKA TRACTOR TEST 1574—DEUTZ-FAHR DX 3.50 DIESEL ALSO DEUTZ-ALLIS 6260 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/hr)	Bhp to (kg/kW)	Hip to (kg/kW)	Crating medium	Air wet bulb	Air dry bulb	Barometer in. Hg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed—Two hours (PTO Speed—815 rpm)								
57.09 (42.57)	2500	5.840 (14.535)	0.472 (0.207)	14.87 (2.926)	235 (112.7)	66 (18.8)	75 (23.8)	29.51 (98.94)

Standard Power Take-off Speed (540 rpm)—One Hour								
55.55 (41.28)	2202	5.578 (13.545)	0.455 (0.276)	15.47 (3.047)	241 (115.8)	67 (19.2)	75 (23.8)	29.50 (98.94)

VARYING POWER AND FUEL CONSUMPTION—Two Hours

49.61 (36.99)	2536	5.068 (13.612)	0.454 (0.264)	16.17 (3.286)	214 (101.1)	68 (19.7)	76 (24.6)	—
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0.00 (0.00)	2636	0.995 (3.787)	—	—	102 (72.2)	67 (19.6)	76 (24.6)	—
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25.25 (18.82)	2600	1.947 (7.268)	0.541 (0.326)	12.96 (2.534)	169 (77.8)	67 (19.6)	75 (23.8)	—
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57.57 (42.78)	2499	5.898 (14.754)	0.476 (0.290)	14.72 (2.900)	225 (106.1)	68 (19.7)	75 (23.8)	—
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12.77 (9.52)	2629	1.429 (5.327)	0.780 (0.475)	8.99 (1.771)	173 (79.2)	67 (19.6)	76 (24.6)	—
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57.67 (42.99)	2387	5.516 (19.521)	0.468 (0.285)	14.97 (2.850)	185 (84.3)	67 (19.6)	76 (24.6)	—
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Ar 59.44 (44.78)	2588	5.597 (14.752)	0.531 (0.323)	13.30 (2.680)	108 (49.4)	67 (19.5)	76 (24.2)	29.50 (98.94)
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DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/hr)	Bhp to (kg/kW)	Hip to (kg/kW)	Crating medium	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
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Maximum Available Power—Two Hours 6th (1H) Gear										
50.22 (37.43)	4099 (18.23)	4.59 (7.39)	2501	6.50 (14.64)	5.879 (0.326)	0.342 (2.550)	193 (89.6)	45 (16.1)	52 (19.8)	29.01 (97.98)

75% of Pull at Maximum Power—Two Hours 6th (1H) Gear										
59.94 (44.78)	5104 (22.81)	4.82 (7.76)	2585	4.75 (11.22)	5.521 (0.317)	15.46 (2.652)	165 (74.1)	43 (17.1)	51 (19.5)	28.95 (97.70)

50% of Pull at Maximum Power—Two Hours 6th (1H) Gear										
27.21 (20.29)	2609 (19.26)	4.95 (7.94)	2608	5.52 (12.85)	2.559 (0.167)	11.65 (2.292)	151 (68.1)	51 (19.1)	55 (21.2)	29.16 (98.47)

50% of Pull at Reduced Engine Speed—Two Hours 6th (1H) Gear										
27.21 (20.29)	2608 (19.26)	4.94 (7.94)	1637 (12.99)	5.32 (12.85)	1.804 (0.281)	15.08 (2.972)	157 (69.4)	41 (14.7)	45 (17.2)	29.08 (98.18)

MAXIMUM POWER IN SELECTED GEARS

46.46 (34.65)	2270	2.40 (12.34)	2515 (13.86)	14.96	2nd (2L) Gear	179 (81.7)	50 (19.0)	54 (22.2)	29.18 (98.54)
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49.59 (36.85)	4899	5.78 (21.76)	2580	7.54 (16.09)	3rd (3L) Gear	192 (88.8)	50 (19.0)	54 (22.2)	29.18 (98.54)
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50.75 (37.83)	4150	4.60 (18.41)	2580	6.24 (17.46)	4th (4H) Gear	195 (89.6)	50 (19.0)	56 (21.3)	29.21 (98.64)
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50.59 (37.56)	5067	6.16 (23.44)	2501	4.52 (19.82)	5th (5L) Gear	188 (85.7)	50 (19.0)	55 (21.2)	29.19 (98.52)
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50.06 (37.13)	2497	7.52 (11.11)	2502	5.39 (12.19)	6th (6H) Gear	189 (87.2)	50 (19.0)	54 (21.2)	29.19 (98.52)
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Dates of Test: September 11 to 25, 1985

Manufacturer: KLOCKNER-HUMBOLDT-DEUTZ AG, 5000 Cologne 80, West Germany

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15°/15°C) 0.8422. Fuel weight 7.012 lb/gal (0.840 kg/l). Oil SAE 15W-40 API service classification CD-SF. To motor 2.584 gal (9.781 l). Drained from motor 1.774 gal (6.714 l). Transmission and final drive lubricant SAE 15W-40 engine oil. Front axle lubricant SAE 90 transmission oil. Total time engine was operated 48.5 hours.

ENGINE: Make Klockner-Humboldt-Deutz Diesel Type three cylinder vertical Serial No. 6435 472 Crankshaft lengthwise Rated rpm 2500 Bore and stroke 4.02" x 4.92" (102 mm x 125 mm) Compression ratio 17 to 1 Displacement 187 cu in (3064 ml) Starting system 12 volt Lubrication pressure Air cleaner one paper element and one felt element Oil filter one full flow cartridge Oil cooler radiator for crankcase oil, radiator for hydraulic oil Fuel filter one paper cartridge Muffler vertical Cooling medium temperature control air cooled.

CHASSIS: Type front wheel assist Serial No. 7744 0415 Tread width rear 35.9" (920 mm) to 75.6" (1920 mm) front 59.1" (1500 mm) to 65.0" (1650 mm) Wheel base 81.9" (2079 mm) Center of gravity (without operator or ballast, with minimum tread; with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 35.6" (904 mm) Vertical distance above roadway 33.2" (844 mm) Horizontal distance from center of rear wheel tread 0.4" (10 mm) to the left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.7 (2.8) second 2.8 (4.5) third 4.1 (6.6) fourth 4.9 (7.9) fifth 6.5 (10.4) sixth 7.8 (12.6) seventh 12.3 (19.8) eighth 18.9 (30.4) reverse 2.0 (3.2), 3.2 (5.1), 4.7 (7.5), 7.5 (11.7) Clutch single dry disc operated by foot pedal Brakes caliper disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 175° (4.43 m) left 154° (3.91 m) on concrete surface without brake) right 192° (4.88 m) left 167° (4.24 m) Turning space diameter (on concrete surface with brake applied) right 362" (9.19 m) left 320" (8.13 m) on concrete surface without brake) right 396" (10.06 m) left 346" (8.79 m) Power take-off 540 rpm at 2202 engine rpm Unladen tractor mass 7080 lb (3211 kg).

LUCKING ABILITY IN 4th (1H) GEAR

Crankshaft Speed rpm	2500	2260	1999	1750	1488	1245
Pull—lb (kN)	4138 (18.41)	4506 (20.04)	4829 (21.48)	5005 (22.25)	5014 (22.50)	4867 (21.85)
Increase in Pull %	0	9	17	21	21	18
Power—Hp (kW)	50.75 (37.83)	49.59 (36.98)	46.74 (34.87)	42.24 (31.30)	53.97 (26.82)	29.29 (21.84)
Speed—Mph (km/h)	4.60 (7.40)	4.15 (6.64)	5.63 (5.84)	5.17 (5.09)	2.69 (4.33)	2.26 (3.63)
Slip %	6.24	6.86	7.56	7.72	7.72	7.72

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours	Front Wheel Drive Disengaged dB(A)	Engaged dB(A)
75% of Pull at Maximum Power—Ten Hours	82.5	82.5
50% of Pull at Maximum Power—Two Hours	85.0	82.5
50% of Pull at Reduced Engine Speed—Two Hours	79.0	79.0
Bystander in 7th (5H) gear	85.5	85.5

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/hr)	Bhp to (kg/kW)	Hip to (kg/kW)	Crating medium	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
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Maximum Available Power—Two Hours 6th (1H) Gear										
48.05 (35.83)	4109 (18.28)	4.59 (7.06)	2499	9.28 (14.64)	5.879 (0.344)	0.566 (2.440)	200 (99.1)	49 (19.4)	56 (21.3)	29.19 (98.57)

(26.98)	(24.85)	(3.91)				(70.3)	(3.0)	(9.4)	(98.13)
49.38 (36.82)	4216 (18.75)	4.59 (7.07)	2500	9.28	4th (1H) Gear	195 (90.3)	50 (19.0)	56 (17.3)	29.20 (98.60)
49.38 (36.82)	5099 (17.78)	5.98 (9.82)	2502	6.16	5th (4L) Gear	195 (89.2)	50 (19.0)	55 (12.8)	29.20 (98.60)

TIRES, BALLAST AND WEIGHT

Rear Tires	Ballast	Without Ballast
—No., size, ply & psi (kPa)	Two 16.9-50, 6, 18 (125)	Two 16.9-50, 6, 18 (125)
—Liquid (each)	640 lb (290 kg)	None
—Cast iron (each)	110 lb (50 kg)	None
Front Tires	Ballast	Without Ballast
—No., size, ply & psi (kPa)	Two 11.2-24, 8, 18 (125)	Two 11.2-24, 8, 18 (125)
—Liquid (each)	None	None
—Cast iron (each)	15 lb (7 kg)	None
Height of Drawbar	17.5 in (445 mm)	17.5 in (445 mm)
Static Weight with Operator—Bear	5600 lb (2567 kg)	4100 lb (1867 kg)
—Front	5150 lb (2320 kg)	3100 lb (1406 kg)
—Total	8750 lb (3967 kg)	7200 lb (3269 kg)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 136°F (57.7°C). Five gears were chosen between 15% slip and 10 mph (16.1 km/h). The cooling air temperature was measured in the air-stream between the two rearmost cylinders.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1574, October 30, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
T. L. THOMPSON
L. L. BASHFORD
Board of Tractor Test Engineers

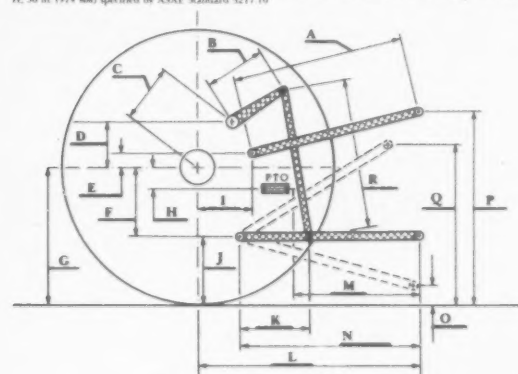
THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2650 (18270)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	175 (79)	
Location	dipstick	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	II	*not measured
LOAD lbs (kg)	4646 (2167)	
TIME sec	1.48	
HITCH POINT MOVEMENT in (mm)		
Lowest position	13.3 (338)	
Top of timed range	33.3 (846)	
Highest position	** 33.8 (859)	
LOAD CG MOVEMENT in (mm)		
Lowest position	13.3 (338)	
Top of timed range	33.4 (848)	
Highest position	33.9 (861)	

* Implements load capacity for transport purposes not specified by manufacturer.

** The observed power range, 20.5 in (522 mm) is less than the minimum power range for Cat II, 24 in (610 mm) specified by ASAE Standard S217.10.

** The observed highest position, 33.8 in (859 mm) is less than the minimum height for highest position for Cat II, 36 in (914 mm) specified by ASAE Standard S217.10.



Hitch Dimensions as Tested — No Load

	inches	mm
A	27.0	686
B	11.0	280
C	12.4	316
D	12.3	312
E	13.4	340
F	6.5	165
G	26.1	663
H	1.7	42
I	11.9	303
J	19.6	498
K	25.0	636
L	39.1	993
M	22.3	566
N	35.6	905
O	8.0	203
P	58.6	981
Q	32.3	819
R	27.4	695



Deuts-Fahr DX 3.50 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Ostvedt, Dean and Director

NEBRASKA TRACTOR TEST 1575—DEUTZ-FAHR DX 4.70 DIESEL 15 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature T (°C)			Barometer inch Hg (kPa)	
		gal/hr (l/h)	Bhp/hr (kg/kW h)	Hp/hr gal (kW/h)	Cooling medium	Air wet bulb		Air dry bulb
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed—1039 rpm)								
85.18 (61.52)	2300	5.162 (19.540)	0.425 (0.258)	16.50 (12.251)	189 (87.0)	56 (13.0)	75 (23.8)	29.13 (98.44)
Standard Power Take-off Speed (1000 rpm) — One Hour								
84.35 (62.90)	2215	4.993 (18.960)	0.415 (0.252)	16.49 (12.226)	191 (88.2)	56 (13.0)	75 (23.8)	29.13 (98.44)
VARYING POWER AND FUEL CONSUMPTION — Two Hours								
74.25 (55.37)	2358	4.561 (17.264)	0.451 (0.282)	16.28 (12.207)	178 (81.1)	66 (18.9)	75 (23.8)	—
0.00 (0.00)	2474	1.198 (4.515)	—	—	156 (68.9)	66 (18.8)	74 (23.3)	—
37.66 (28.00)	2595	2.838 (10.819)	0.532 (0.326)	13.18 (2.596)	162 (71.9)	66 (18.9)	77 (24.7)	—
85.46 (63.73)	2501	5.185 (19.629)	0.425 (0.259)	16.48 (12.247)	184 (84.4)	67 (19.2)	77 (25.0)	—
19.04 (14.20)	2420	1.947 (7.369)	0.717 (0.456)	9.78 (1.927)	134 (57.5)	66 (18.9)	75 (23.6)	—
56.07 (41.81)	2374	3.667 (13.879)	0.459 (0.279)	15.29 (11.012)	168 (73.6)	67 (19.2)	75 (23.9)	—
Av (33.86)	2387	3.236 (12.249)	0.500 (0.304)	14.85 (2.745)	167 (74.9)	66 (18.9)	75 (24.8)	29.11 (98.30)

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	SHP %	Fuel Consumption		Temp. °F (°C)				Barom. in (kPa)
					gal/hr (l/h)	Bhp/hr (kg/kWh)	Cool- ing med.	Air wet bulb	Air dry bulb		
Maximum Available Power — Two Hours 8th (3M) Gear											
75.23 (54.61)	5546 (23.78)	5.14 (8.27)	2301	4.65	5.094 (19.246)	0.487 (0.296)	14.40 (2.877)	189 (87.2)	74 (23.1)	84 (28.6)	28.84 (97.39)
75% of Pull at Maximum Power — Ten Hours 8th (3M) Gear											
58.58 (43.68)	4097 (18.22)	5.36 (8.63)	2360	3.19	4.256 (16.109)	0.509 (0.310)	13.76 (2.712)	175 (79.6)	73 (22.9)	85 (28.2)	28.81 (97.27)
50% of Pull at Maximum Power — Two Hours 8th (3M) Gear											
59.72 (29.62)	2732 (12.15)	5.45 (8.77)	2579	2.06	3.509 (12.524)	0.584 (0.355)	12.00 (2.365)	173 (77.1)	73 (22.1)	81 (26.9)	28.62 (96.65)
50% of Pull at Reduced Engine Speed — Two Hours 11th (2H) Gear											
59.75 (29.62)	2731 (12.15)	5.45 (8.78)	1477	2.01	2.600 (10.068)	0.460 (0.286)	14.94 (2.942)	182 (83.2)	74 (23.1)	84 (28.6)	28.61 (96.61)

MAXIMUM POWER IN SELECTED GEARS

64.67 (48.22)	10502 (46.71)	2.51 (3.72)	2345	15.05	3rd (3L) Gear	172 (77.3)	67 (19.6)	74 (23.3)	28.85 (97.42)
71.95 (53.64)	9507 (42.29)	2.84 (4.57)	2502	10.39	4th (1M) Gear	169 (76.1)	67 (19.6)	70 (21.1)	28.65 (96.68)
74.73 (55.73)	8071 (35.90)	3.47 (5.59)	2299	8.06	5th (4L) Gear	169 (77.8)	67 (19.6)	71 (21.7)	28.65 (96.68)
74.45 (55.50)	7024 (31.24)	3.97 (6.39)	2298	6.59	6th (2M) Gear	171 (76.9)	68 (20.0)	72 (22.2)	28.65 (96.68)
75.72 (55.97)	6540 (29.20)	4.36 (7.02)	2298	5.84	7th (5L) Gear	174 (78.6)	68 (20.0)	75 (22.8)	28.65 (96.68)
74.62 (55.64)	5465 (24.30)	5.12 (8.24)	2300	5.00	8th (3M) Gear	177 (80.6)	70 (21.1)	75 (21.9)	28.65 (96.68)
74.16 (55.30)	4496 (20.00)	6.19 (9.96)	2297	3.83	9th (1H) Gear	179 (81.7)	70 (21.1)	76 (24.4)	28.64 (96.71)
75.15 (56.02)	3725 (16.37)	7.56 (12.17)	2300	3.11	10th (4M) Gear	182 (83.3)	70 (21.1)	77 (25.0)	28.64 (96.71)
72.42 (54.01)	3219 (14.32)	8.44 (13.50)	2299	2.71	11th (2H) Gear	182 (83.1)	71 (21.7)	78 (25.6)	28.64 (96.71)

Department of Agricultural Engineering

Dates of Test: September 10 to 19, 1985

Manufacturer: KLOCKNER-HUMBOLDT-DEUTZ AG, 5000 Cologne 80, West Germany

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°F (15°C) 0.8422 Fuel weight 7.012 lbs/gal (0.840 kg/l) Oil SAE 15W-40 API service classification CD-SF To motor 3.189 gal (12.071 l) Drained from motor 1.646 gal (6.232 l) Transmission lubricant SAE 15W-40 engine oil Front axle lubricant SAE 90 EP transmission oil Total time engine was operated 42.5 hours.

ENGINE: Make Klockner-Humboldt-Deutz Diesel Type four cylinder vertical with turbocharger Serial No. 7014970 Crankshaft lengthwise Rated rpm 2300 Bore and stroke 4.02" x 4.92" (102 mm x 125 mm) Compression ratio 15.5 to 1 Displacement 249 cu in (4085 ml) Starting system 12 volt Lubrication pressure Air cleaner one paper element and one felt element Oil filter one full flow cartridge Oil cooler radiator for crankcase oil, radiator for hydraulic oil Fuel filter one paper cartridge Muffler vertical Cooling medium temperature control variable speed fan controlled by exhaust temperature sensor.

CHASSIS: Type front wheel assist Serial No. 7455 1656 Tread width rear 63" (1600 mm) to 78.7" (2000 mm) front 63" (1600 mm) to 70.9" (1800 mm) Wheel base 94.5" (2400 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 32.5" (825 mm) Vertical distance above roadway 37.0" (939 mm) Horizontal distance from center of rear wheel tread 0.5" (13 mm) to the left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.6 (2.5) second 2.1 (3.3) third 2.6 (4.2) fourth 3.2 (5.1) fifth 3.8 (6.1) sixth 4.5 (6.9) seventh 4.6 (7.4) eighth 5.4 (8.7) ninth 6.4 (10.3) tenth 7.8 (12.5) eleventh 8.7 (14.0) twelfth 9.6 (15.3) thirteenth 10.9 (17.6) fourteenth 16.2 (26.1) fifteenth 19.5 (31.3) reverse 3.0 (4.8), 4.0 (6.4), 5.0 (8.1), 7.3 (11.7), 9.0 (14.5) Clutch single dry disc operated by foot pedal Brakes caliper disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 152" (3.87 m) left 151" (3.83 m) (on concrete surface without brake) right 178" (4.53 m) left 178" (4.51 m) Turning speed diameter (on concrete surface with brake applied) right 351" (8.92 m) left 328" (8.34 m) (on concrete surface without brake) right 383" (9.74 m) left 362" (9.20 m) Power take-off 540 rpm at 2192 engine rpm and 1000 rpm at 2215 engine rpm Unladen tractor mass 9900 lb (4491 kg).

LUGGING ABILITY IN 8th (3M) GEAR

Crankshaft Speed rpm	2500	2069	1835	1610	1579	1151
Pull—lbs (kN)	5465 (24.30)	5874 (26.13)	6179 (27.49)	6251 (27.72)	6022 (26.79)	5590 (24.87)
Increase in Pull %	0	8	15	14	10	2
Power—Hp (kW)	74.62 (55.64)	71.79 (53.54)	66.71 (49.25)	59.06 (44.04)	49.01 (36.54)	58.15 (43.45)
Speed—Mph (km/h)	5.12 (8.24)	4.58 (7.38)	4.05 (6.52)	3.55 (5.72)	3.05 (4.91)	2.56 (4.12)
Slip %	5.00	5.58	5.69	5.69	5.54	5.00

TRACTOR SOUND LEVEL WITH CAB

	Front Wheel Drive Disengaged dB(A)	Engaged dB(A)
Maximum Available Power—Two Hours	79.5	78.5
75% of Pull at Maximum Power—Ten Hours		79.5
50% of Pull at Maximum Power—Two Hours		79.0
50% of Pull at Reduced Engine Speed—Two Hours		75.0
Bystander in 14th (4H) gear	84.0	

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	Bohp/hr (kW/h)	Temp. °F (°C)	Barom. sea level (kPa)
							Air wet bulb	Air dry (bulb)
Maximum Available Power — Two Hours 8th (3M) Gear								
72.06 (53.73)	5464 (24.30)	4.95 (7.96)	2299	7.52	5.127 (19.408)	4.099 (3.030)	14.05 (81.9)	70 (20.6)
28.84 (21.3)								
MAXIMUM POWER IN SELECTED GEARS								
61.43 (45.81)	8417 (37.44)	2.74 (4.40)	2350	14.74		4th (1M) Gear	169 (79.8)	68 (20.0)
75.84 (55.96)	5599 (24.91)	4.95 (7.96)	2299	7.38		8th (3M) Gear	175 (78.1)	69 (20.6)
73.72 (54.97)	4594 (20.44)	6.02 (9.68)	2299	5.82		9th (1H) Gear	180 (81.9)	70 (21.1)
74.24 (55.36)	3778 (16.81)	7.57 (11.86)	2299	4.91		10th (4M) Gear	181 (82.5)	70 (21.1)

TIRES, BALLAST AND WEIGHT

Base Time	—No. size, ply & psi (kPa)	With Ballast	Without Ballast
Ballast	—Liquid (each)	Two 18.4-58, 6, 16 (110)	Two 18.4-58, 6, 16 (110)
	—Cast iron (each)	1057 lb (470 kg)	None
	—Cast iron (each)	105 lb (48 kg)	None
Final Time	—No. size, ply & psi (kPa)	With Ballast	Without Ballast
Ballast	—Liquid (each)	Two 13.6-28, 6, 16 (110)	Two 13.6-28, 6, 16 (110)
	—Cast iron (each)	None	None
	—Cast iron (each)	648 lb (294 kg)	None
Height of Drawbar		20.5 in (520 mm)	20.5 in (520 mm)
Static Weight with Operator—Rear		8965 lb (4066 kg)	9680 lb (4390 kg)
—Front		4695 lb (2130 kg)	3400 lb (1542 kg)
—Total		13660 lb (6196 kg)	13080 lb (5972 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2600 (17930)		
Location	remote outlet		
Hydraulic oil temperature °F (°C)	151 (66)		
Location	dipstick		
Maximum Lift Capacity			
	(With one boost cylinder)		(With optional Rear boost cylinder)
QUICK ATTACH	no		no
CATEGORY	II		II
LOAD lbs (kg)	5404 (2451)		7170 (3252)
TIME sec	2.62		3.54
HITCH POINT MOVEMENT in (mm)			
Lowest position	12.1 (107)		12.2 (110)
Top of timed range	36.1 (917)		36.2 (919)
Highest position	36.4 (923)		36.5 (927)
LOAD CG MOVEMENT in (mm)			
Lowest position	11.8 (100)		12.1 (107)
Top of timed range	37.8 (960)		38.0 (963)
Highest position	38.2 (970)		38.2 (970)

*Implement load capacity for transport purposes not specified by manufacturer.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

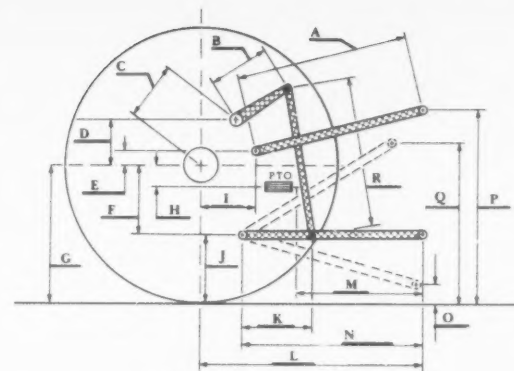
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power test, the fuel temperature at the injection pump inlet was maintained at 108°F (42.5°C). Nine gears were chosen between 15% slip and 10 mph (16.1 km/h). The pull in 3rd (3L) gear was limited to avoid tractor bouncing. The cooling air temperature was measured in the airstream between the two rear-most cylinders.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1575, October 30, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
T. L. THOMPSON
L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	in	mm
A	27.8	705
B	12.6	320
C	16.9	428
D	16.2	412
E	7.8	197
F	10.2	260
G	31.2	793
H	6.5	164
I	14.7	374
J	21.0	533
K	22.4	568
L	42.8	1087
M	22.1	562
N	37.0	940
O	8.0	203
P	40.0	1016
Q	34.5	876
R	33.3	845



Deutz-Fahr DX 4.70 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1576—DEUTZ-FAHR DX 6.50 DIESEL 24 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)				Barometer in. Hg (kPa)
		gal/hr (l/h)	lb/hp hr (kg/kW h)	Hp hr gal (kW h/l)	Cooling medium	wet bulb	air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two hours (FTO Speed—1039 rpm)								
122.06 (91.02)	2300	7.410 (28.049)	0.426 (0.259)	16.47 (3.243)	200 (93.3)	65 (18.3)	75 (24.0)	29.15 (98.37)
Standard Power Take-off Speed (1000 rpm)—One Hour								
123.15 (91.84)	2215	7.181 (27.183)	0.409 (0.249)	17.15 (3.178)	203 (94.8)	66 (18.6)	75 (23.6)	29.04 (98.06)
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
107.32 (80.01)	2579	6.767 (25.618)	0.442 (0.269)	15.86 (3.244)	195 (90.3)	66 (18.0)	75 (23.9)	29.15 (98.37)
0.00 (0.00)	2408	1.660 (6.283)	—	—	188 (86.7)	66 (18.9)	75 (23.6)	—
54.68 (40.78)	2425	4.342 (16.416)	0.557 (0.339)	12.59 (2.481)	168 (75.3)	67 (19.2)	75 (23.6)	—
122.59 (91.42)	2500	7.373 (27.917)	0.422 (0.257)	16.62 (3.275)	192 (88.9)	66 (18.9)	75 (23.6)	29.15 (98.37)
27.61 (20.59)	2452	5.183 (19.448)	0.808 (0.492)	8.68 (1.709)	171 (76.9)	66 (18.9)	76 (24.2)	29.15 (98.37)
81.50 (60.77)	2408	5.555 (21.019)	0.478 (0.291)	14.68 (2.891)	175 (79.2)	66 (18.9)	75 (23.6)	29.15 (98.37)
Av (+69.93)	63.62 2405	4.813 (18.220)	0.514 (0.313)	13.63 (2.686)	181 (82.9)	66 (18.9)	75 (23.8)	29.00 (98.20)

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)				Barom. in. Hg (kPa)
					gal/hr (l/h)	lb/hp hr (kg/kW h)	Cool- ing	Air wet bulb	Air dry bulb		
Maximum Available Power — Two Hours 13th (3ML) Gear											
104.05 (77.59)	7719 (34.34)	5.05 (8.13)	2300	5.83 (27.744)	7.929 (30.306)	0.494 (2.797)	14.20 (3.191)	192	67	70	28.79 (97.20)
75% of Pull at Maximum Power — Ten Hours 13th (3ML) Gear											
83.93 (62.59)	5856 (26.06)	5.37 (8.65)	2406	4.51 (24.473)	6.465 (24.329)	0.540 (2.557)	12.98 (2.557)	162	52	55	29.50 (98.93)
50% of Pull at Maximum Power — Two Hours 13th (3ML) Gear											
57.24 (42.68)	3906 (17.37)	5.30 (8.64)	2421	2.69 (19.081)	5.041 (19.716)	0.618 (2.237)	11.36 (2.237)	159	60	62	29.10 (98.25)
50% of Pull at Reduced Engine Speed — Two Hours 18th (4MH) Gear											
57.25 (42.69)	3907 (17.38)	5.30 (8.64)	1597	2.69 (14.547)	3.843 (14.547)	0.471 (2.286)	14.90 (2.935)	183	61	63	29.08 (98.18)

Department of Agricultural Engineering

Dates of Test: September 9 to 17, 1985

Manufacturer: KLOCKNER-HUMBOLDT-
DEUTZ AG, 5000 Cologne 80, West Germany

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 46.9 (rating taken from oil company's
inspection data) Specific gravity converted to 60°/
60°F (15°/15°C) 0.8423 Fuel weight 7.013 lb/gal
(0.840 kg/l) Oil SAE 15W-40 API service classi-
fication CD-SF To motor 4.800 gal (18.169 l)
Drained from motor 3.570 gal (13.514 l) Trans-
mission lubricant SAE 15W-40 engine oil Front
axle lubricant SAE 90 EP transmission oil Total
time engine was operated 44.5 hours.

ENGINE: Make Klockner-Humboldt-Deutz
Diesel Type six cylinder vertical with turbocharger
Serial No. 7994949 Crankshaft lengthwise Rated
rpm 2300 Bore and stroke 4.02" x 4.92" (102 mm
x 125 mm) Compression ratio 15.5 to 1 Displace-
ment 374 cu in (6128 ml) Starting system 12 volt
Lubrication pressure Air cleaner two paper ele-
ments and centrifugal pre-cleaner Oil filter one
full flow cartridge Oil cooler radiator for crank-
case oil, radiator for hydraulic oil, radiator for
transmission oil Fuel filter one paper cartridge
Muffler vertical Cooling medium temperature
control variable speed fan controlled by exhaust
temperature sensor.

CHASSIS: Type front wheel assist Serial No.
7441 0761 Tread width rear 70.9" (1800 mm) to
86.6" (2200 mm) front 70.9" (1800 mm) to 78.7"
(2000 mm) Wheel base 106.4" (2703 mm) Center of
gravity (without operator or ballast, with mini-
mum tread, with fuel tank filled and tractor ser-
viced for operation) Horizontal distance forward
from center-line of rear wheels 36.8" (934 mm)
Vertical distance above roadway 39.6" (1006 mm)
Horizontal distance from center of rear wheel tread
0.1" (3 mm) to the left Hydraulic control system
direct engine drive Transmission selective gear
fixed ratio with partial (2) range operator con-
trolled powershift Advertised speeds mph (km/h)
first 1.5 (2.4) second 1.8 (2.9) third 2.0 (3.2) fourth
2.4 (3.9) fifth 2.5 (4.1) sixth 3.0 (4.9) seventh 3.2
(5.1) eighth 3.6 (5.8) ninth 3.7 (6.0) tenth 4.0 (6.5)
eleventh 4.5 (7.2) twelfth 5.0 (8.1) thirteenth 5.3
(8.6) fourteenth 6.2 (9.9) fifteenth 6.6 (10.6) six-
teenth 7.5 (12.0) seventeenth 7.6 (12.2) eighteenth
8.3 (13.3) nineteenth 9.2 (14.8) twentieth 10.3 (16.5)
twenty-first 10.8 (17.4) twenty-second 13.4 (21.6)
twenty-third 15.5 (25.0) twenty-fourth 18.6 (30.0)

MAXIMUM POWER IN SELECTED GEARS

95.79 (71.43)	13633 (60.64)	2.63 (4.24)	2334 (14.24)	14.87	5th (1ML) Gear	181	63	65	28.81 (97.29)
98.56 (73.33)	13344 (59.36)	2.76 (4.43)	2298 (14.43)	15.89	7th (3LH) Gear	183	64	66	28.81 (97.29)
100.26 (74.77)	11509 (51.19)	3.27 (5.26)	2299 (14.24)	10.11	8th (4LL) Gear	184	64	67	28.81 (97.29)
101.18 (75.45)	11133 (49.32)	3.41 (5.49)	2301 (14.24)	9.53	9th (1MH) Gear	184	65	67	28.80 (97.25)
102.62 (76.32)	10264 (45.64)	3.75 (6.03)	2300 (14.24)	8.50	10th (2ML) Gear	186	65	67	28.80 (97.25)
102.09 (76.13)	9177 (40.82)	4.17 (6.71)	2300 (14.24)	7.07	11th (4LH) Gear	188	65	67	28.80 (97.25)
103.77 (77.38)	8180 (36.39)	4.76 (7.66)	2300 (14.24)	6.14	12th (2MH) Gear	189	65	68	28.79 (97.22)
105.49 (78.66)	7811 (34.73)	5.06 (8.15)	2299 (14.24)	5.67	13th (5ML) Gear	185	58	62	29.10 (98.27)
103.81 (77.41)	6577 (29.26)	5.92 (9.53)	2299 (14.24)	4.55	14th (1HL) Gear	183	58	62	29.10 (98.27)
105.04 (78.33)	6191 (27.34)	6.36 (10.24)	2299 (14.24)	4.22	15th (3MH) Gear	184	58	62	29.11 (98.30)
102.15 (76.17)	5283 (23.50)	7.25 (11.67)	2300 (14.24)	5.49	16th (4ML) Gear	181	58	62	29.11 (98.30)
102.52 (76.43)	5189 (23.08)	7.41 (11.92)	2300 (14.24)	5.32	17th (1HH) Gear	181	58	62	29.12 (98.31)
101.81 (75.92)	4724 (21.81)	8.08 (13.01)	2300 (14.24)	3.24	18th (2HL) Gear	182	59	62	29.12 (98.31)

LUGGING ABILITY IN 13th (3ML) GEAR

Crankshaft Speed rpm	2299	2072	1838	1609	1387	1156
Pull—lb (kN)	7811 (34.73)	9222 (41.02)	10130 (45.06)	10379 (46.17)	9980 (44.39)	9218 (41.00)
Increase in Pull %	0	18	50	53	28	18
Power—Hp (kW)	105.49 (78.66)	110.85 (82.86)	106.82 (79.63)	95.41 (71.15)	79.47 (59.26)	61.70 (45.01)
Speed—Mph (km/h)	5.06 (8.13)	4.51 (7.25)	3.95 (6.36)	3.45 (5.55)	2.99 (4.81)	2.51 (4.04)
Slip %	5.67	6.76	7.83	8.28	7.68	7.07

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours		79.5	79.5
75% of Pull at Maximum Power—Ten Hours		79.0	79.0
50% of Pull at Maximum Power—Two Hours		78.5	78.5
50% of Pull at Reduced Engine Speed—Two Hours		77.0	77.0
Bystander in 23rd (4HL) gear		87.0	87.0

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)				Barom. in. Hg (kPa)
					gal/hr (l/h)	lb/hp hr (kg/kW h)	Cool- ing	Air wet bulb	Air dry bulb		
Maximum Available Power — Two Hours 13th (3ML) Gear											
101.56 (75.59)	7818 (34.77)	4.86 (7.83)	2300	9.16 (27.771)	7.356 (30.306)	0.508 (2.722)	13.82 (3.031)	195 (80.3)	68 (20.0)	72 (21.9)	28.75 (97.07)
MAXIMUM POWER IN SELECTED GEARS											
95.99 (70.69)	10734 (47.75)	5.28 (8.50)	2365	14.95	9th (1MH) Gear		185 (83.0)	65 (18.3)	67 (19.6)	28.80 (97.25)	
103.56 (77.23)	7919 (35.23)	4.90 (7.89)	2302	8.59	13th (5ML) Gear		184 (84.6)	58 (14.4)	62 (16.7)	29.10 (97.20)	
105.65 (77.27)	6267 (28.88)	6.20 (9.98)	2299	6.34	15th (3MH) Gear		181 (82.8)	58 (14.4)	62 (16.7)	29.11 (97.18)	

reverse 2.8 (4.5), 3.5 (5.6), 3.8 (6.1), 4.7 (7.6), 5.0
(8.0) 6.2 (9.9), 7.0 (11.2), 8.6 (13.9), Clutch dual
dry disc hydraulically power actuated by foot pedal
Brakes caliper disc hydraulically operated by two
foot pedals which can be locked together Steering
hydraulic Turning radius (on concrete surface
with brake applied) right 161" (4.09 m) left 161"
(4.09 m) (on concrete surface without brake) right
183.5" (4.66 m) left 183.5" (4.66 m) Turning space
diameter (on concrete surface with brake applied)
right 339" (8.61 m) left 339" (8.61 m) (on concrete
surface without brake) right 384" (9.75 m) left 384"
(9.75 m) Power take-off 540 rpm at 2192 engine
rpm and 1000 rpm at 2215 engine rpm Unladen
tractor mass 11950 lb (5421 kg)

REPAIRS AND ADJUSTMENTS: No repairs
or adjustments.

REMARKS: All test results were determined
from observed data obtained in accordance with
SAE and ASAE test codes and the technically
equivalent ISO test codes or official Nebraska test
procedure. For the maximum power tests, the fuel
temperature at the injection pump inlet was main-
tained at 125°F (51.6°C). Thirteen gears were cho-
sen between 15% slip and 10 mph (16.1 km/h). The
cooling air temperature was measured in the air-
stream between the two rearmost cylinders.

We, the undersigned, certify that this is a true
and correct report of official Tractor Test No. 1576,
October 30, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
T. L. THOMPSON
L. L. BASHFORD
Board of Tractor Test Engineers

TIRES, BALLAST AND WEIGHT		
Rear Tires	—No., size, ply & psi (kPa)	With Ballast
	—Liquid (inch)	Two 20.5-20, 8, 18 (125)
	—Gas (inch)	800 lb. (413 kg)
Front Tires	—No., size, ply & psi (kPa)	With Ballast
	—Liquid (inch)	Two 16.5-20, 6, 18 (125)
	—Gas (inch)	800 lb. (413 kg)
Height of Drawbar		
—No. in. (mm)		30 in. (762 mm)
—Total		1780 lb. (798 kg)
—Total		1780 lb. (798 kg)

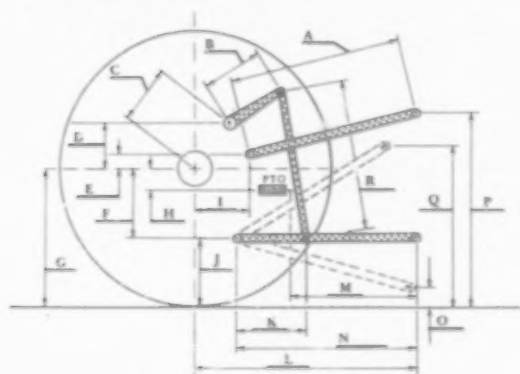
THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2675 (18440)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	147 (64)	
Location	displacement	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	III	*not measured
LOAD lb. (kg)	8966 (4068)	
TIME sec	5.55	
HITCH POINT MOVEMENT in. (mm)		
Lowest position	10.7 (272)	
Top of timed range	55.7 (1416)	
Highest position	** 54.1 (1368)	
LOAD CG MOVEMENT in. (mm)		
Lowest position	10.5 (267)	
Top of timed range	55.7 (1416)	
Highest position	56.5 (1432)	

*Implement load capacity for transport purposes not specified by manufacturer.

** The observed power range, 25.4 in. (646 mm), is less than the minimum power range for Cat III, 26 in. (660 mm) specified by ASAE Standard S217.10.

** The observed highest position, 54.1 in. (1368 mm), is less than the minimum height for highest position for Cat III, 40 in. (1016 mm) specified by ASAE Standard S217.10.



Hitch Dimensions as Tested — No Load

	inch	mm
A	27.0	686
B	12.6	320
C	16.9	428
D	16.2	412
E	9.7	247
F	10.2	260
G	52.5	1325
H	6.5	164
I	14.7	374
J	22.3	565
K	23.8	605
L	43.4	1102
M	22.6	575
N	57.6	1465
O	8.0	203
P	44.3	1124
Q	54.5	1376
R	54.0	1371



Deutz-Fahr DX 6.50 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1573—FORD 2810 (8x2) DIESEL

8 speed

POWER TAKE-OFF PERFORMANCE

Power hp (kW)	Crank shaft speed rpm	Fuel Consumption gph (l/hr)	Oil consumption gph (l/hr)	Temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)
32.85	2000	2.217	0.474	14.81	188	65	75	28.90	(24.40)
		(8.793)	(1.786)	(2.827)	(86.5)	(17.4)	(23.8)	(197.8)	

MAXIMUM POWER AND FUEL CONSUMPTION

32.85	2000	2.217	0.474	14.81	188	65	75	28.90	(24.40)
		(8.793)	(1.786)	(2.827)	(86.5)	(17.4)	(23.8)	(197.8)	

Standard Power Take-off Speed (540 rpm) — One Hour

31.82	1800	2.095	0.461	15.20	188	65	75	29.00	(24.75)
		(8.024)	(1.781)	(2.994)	(86.5)	(17.2)	(23.8)	(197.8)	

VARYING POWER AND FUEL CONSUMPTION — Two Hours

(0.00)	2195	(2.994)			(81.1)	(19.6)	(23.5)		
14.88	2152	1.577	0.649	10.80	182	65	74		(11.08)
		(5.924)	(2.495)	(2.277)	(84.5)	(18.6)	(23.5)		
30.91	2000	2.212	0.471	14.80	188	65	75		(24.74)
		(8.572)	(1.787)	(2.821)	(86.4)	(17.2)	(23.8)		
7.54	2161	1.069	0.594	7.05	182	65	75		(15.85)
		(4.048)	(2.247)	(2.190)	(84.5)	(17.2)	(23.8)		
21.94	2096	1.705	0.544	12.80	184	65	74		(19.56)
		(6.447)	(2.031)	(2.190)	(84.4)	(17.2)	(23.8)		
As	17.64	2105	1.524	0.608	11.57	185	65	74	25.85
		(5.778)	(2.466)	(2.276)	(84.8)	(17.1)	(23.5)	(198.8)	

DRAWBAR PERFORMANCE

Power hp (kW)	Drawbar pull lb (kg)	Speed mph (km/h)	Crank shaft speed rpm	Temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)	Oil temp °F (°C)
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Maximum Available Power — Two Hours 8th Gear

28.19	1795	5.89	1999	5.24	2.195	0.544	12.80	184	64	72	28.97	(21.62)	(7.46)	(19.48)	(8.295)	(1.781)	(2.192)	(84.2)	(17.1)	(23.6)	(197.8)
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75% of Pull at Maximum Power — Ten Hours 8th Gear

25.07	1595	6.21	2085	4.20	1.924	0.545	11.90	187	62	65	29.07	(17.20)	(18.20)	(19.48)	(7.282)	(1.786)	(2.192)	(84.5)	(16.8)	(23.5)	(197.8)
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50% of Pull at Maximum Power — Two Hours 8th Gear

15.90	929	6.42	2126	2.94	1.197	0.704	9.90	188	64	67	29.10	(11.86)	(16.11)	(19.51)	(8.045)	(1.428)	(2.192)	(86.1)	(17.8)	(23.2)	(198.4)
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50% of Pull at Reduced Engine Speed — Two Hours 8th Gear

15.91	929	6.42	1702	2.77	1.385	0.610	11.50	186	65	70	29.17	(11.86)	(16.11)	(19.51)	(7.276)	(1.571)	(2.285)	(84.8)	(18.1)	(21.1)	(198.5)
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MAXIMUM POWER IN SELECTED GEARS

30.56	6050	1.51	2000	14.81	2nd Gear	188	65	65	29.14	(19.13)	(17.85)	(18.05)										
27.50	2987	3.45	1940	9.53	3rd Gear	188	62	69	28.90	(26.51)	(17.26)	(17.56)										
28.15	2174	4.80	1908	6.55	4th Gear	188	62	69	29.00	(28.94)	(18.61)	(17.81)										
29.14	1817	5.88	1998	3.55	5th Gear	189	65	71	28.97	(27.73)	(18.26)	(18.41)										
28.50	1445	7.45	1908	4.15	6th Gear	188	62	69	28.90	(21.52)	(18.42)	(17.90)										

Department of Agricultural Engineering

Date of Test September 6 to 11, 1980

Manufacturer: FORD MOTOR COMPANY, Ford Tractor Operations, 2500 Maple Road, Troy, Michigan 48064

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°F/60°F (15°C/15°C) 0.8423 Fuel weight 7.015 lb/gal (0.049 kg/l) Oil SAE 15W-40 API service classification 50, CD To motor 1.303 gal (5.214 l) Drained from motor 1.232 gal (4.663 l) Transmission and final drive lubrication Ford MDC-1348 fluid Total time engine was operated 51.0 hours.

ENGINE: Make Ford Diesel Type three cylinder vertical Serial No. *B020799* Crankshaft lengthwise Rated rpm 2000 Bore and stroke 1.2 x 5.8" (30.7 mm x 96.5 mm) Compression ratio 17.5 to 1 Displacement 158 cu in (2.589 m) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow paper cartridge Fuel filter one paper element Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type standard Serial No. *C738800* Trend width rear 56" (1424 mm) to 80" (2032 mm) front 52" (1320 mm) to 80" (2032 mm) Wheel base 72.5" (1854 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 28.5" (724 mm) Vertical distance above roadway 28.5" (724 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right: left Hydraulic control system direct engine drive Transmission selective gear fixed ratios Advertised speeds mph (km/h) first 1.7 (2.8) second 2.2 (3.5) third 3.8 (6.1) fourth 5.2 (8.3) fifth 6.2 (9.9) sixth 7.7 (12.4) seventh 13.5 (21.8) eighth 18.3 (29.4) reverse 2.5 (4.0), 8.9 (14.3) Clutch single plate dry disc operated by foot pedal Brakes wet multiple disc operated by two foot pedals which can be locked together Steering power assist Turning radius on concrete surface with brake applied: right 114" (2.89 m) left 114" (2.89 m) on concrete surface without brake: right 130" (3.45 m) left 130" (3.45 m) Turning space diameter on concrete surface with brake applied: right 233" (5.92 m) left 233" (5.92 m) on concrete surface without brake: right 275" (6.98 m) left 275" (6.98 m) Power take-off 540 rpm at 1800 engine rpm Unladen tractor mass 4465 lb (2025 kg).

LUGGING ABILITY IN 5th GEAR

Crankshaft speed rpm	1988	1792	1596	1407	1205	1010
Pull—lb (kg)	1857 (83.9)	1980 (89.8)	1975 (89.5)	2162 (97.6)	2190 (99.3)	2194 (99.4)
Increase in Pull lb (kg)	0	7	12	40	19	16
Power—hp (kW)	20.14 (15.1)	21.74 (16.0)	23.85 (17.6)	23.65 (17.6)	20.45 (15.2)	17.10 (12.7)
Speed—mph (km/h)	5.88 (9.47)	5.25 (8.49)	4.67 (7.51)	4.10 (6.60)	3.50 (5.64)	2.90 (4.71)
Slip %	5.55	5.74	5.97	6.50	6.41	6.52

TRACTOR SOUND LEVEL WITHOUT CAB

Maximum Available Power—Two Hours	95.0
75% of Pull at Maximum Power—Two Hours	95.0
50% of Pull at Maximum Power—Two Hours	94.0
50% of Pull at Reduced Engine Speed—Two Hours	91.5
Residual in 7th gear	94.0

TIRES, BALLAST AND WEIGHT

Base Tire	With Ballast	Without Ballast
Base Tire	—No. size, ply & psi (kPa)	Two 15.5-20, 4, 14 (95)
Ballast	—Liquid (mils)	600 lb (269 kg)
	—Gas (mils)	100 lb (45 kg)
Front Tire	—No. size, ply & psi (kPa)	Two 8.00-16, 4, 30 (205)
Ballast	—Liquid (mils)	None
	—Gas (mils)	47 lb (21 kg)
Height of Tire	—Liquid (mils)	17 in (430 mm)
	—Gas (mils)	17 in (430 mm)
Static Weight with Operator—Base	4155 lb (1885 kg)	2605 lb (1182 kg)
	—Front	1000 lb (454 kg)
	—Total	3605 lb (1637 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2325 (161.0)	
Location	retract outlet	
Hydraulic oil temperature °F (°C)	180 (71)	
Location	fuel drive	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	40	
LOAD lb (kg)	2036 (922)	*not measured
TIME sec	2.56	
HITCH POINT MOVEMENT in (mm)		
Lowest position	8.0 (203)	
Top of travel range	30.1 (763)	
Highest position	32.0 (813)	
LOAD CG MOVEMENT in (mm)		
Lowest position	7.4 (188)	
Top of travel range	35.0 (893)	
Highest position	36.1 (927)	

*Implosion test capacity for transport purposes not specified by manufacturer

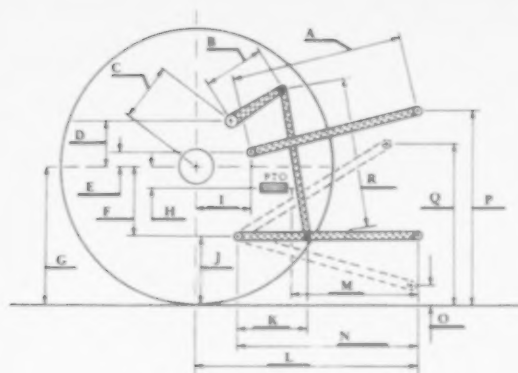
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power test, the fuel temperature at the injection pump was maintained at 131°F (55°C). Five gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1573, October 29, 1985.

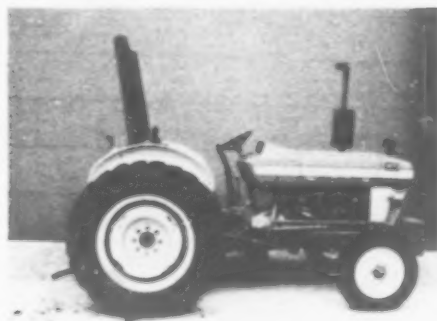
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
T. L. THOMPSON
L. L. BASHFORD
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	25.9	657
B	10.0	254
C	12.9	327
D	10.1	257
E	7.5	191
F	8.0	203
G	25.6	650
H	4.7	119
I	8.7	220
J	15.6	397
K	17.2	437
L	34.2	869
M	18.5	469
N	31.5	800
O	8.0	203
P	33.6	854
Q	32.9	835
R	28.0	711



Ford 2810 Diesel

NEBRASKA TRACTOR TEST 1579—HESSTON 45-66DT FIAT DIESEL ALSO HESSTON 45-66 FIAT DIESEL

12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crash shaft speed rpm	Fuel Consumption gal/hr (kg/hr)	Hp to gal (kg/hr)	Cooling medium	Temp °F (°C) air oil water	Barometer inch Hg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed — 614 rpm)						
59.49 (29.45)	2500	2.512 (9.508)	0.446 (0.271)	15.72 (3.007)	175 (79.2)	61 (24.8)

Standard Power Take-off Speed (540 rpm) — One Hour						
57.97 (28.31)	2199	2.291 (8.635)	0.421 (0.256)	16.65 (3.279)	175 (79.2)	61 (24.8)

VARYING POWER AND FUEL CONSUMPTION — Two Hours						
55.95 (28.1)	2670	2.415 (9.136)	0.471 (0.206)	14.90 (2.936)	175 (79.2)	61 (24.8)

0.00 (0.00)	2759	0.941 (3.566)	—	—	171 (77.2)	61 (24.8)
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18.21 (11.50)	2712	1.615 (6.105)	0.621 (0.376)	11.29 (2.224)	172 (77.8)	61 (24.8)
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59.52 (29.32)	2501	2.507 (9.492)	0.447 (0.272)	15.68 (3.089)	176 (79.2)	61 (24.8)
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9.18 (4.45)	2756	1.267 (4.795)	0.907 (0.508)	7.25 (1.426)	171 (77.2)	62 (24.8)
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27.12 (20.22)	2683	1.977 (7.481)	0.511 (0.311)	15.72 (2.702)	175 (78.3)	62 (24.2)
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Ar (24.1)	21.65 (10.1)	2500	1.706 (6.768)	0.579 (0.352)	12.11 (2.385)	175 (78.2)
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DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crash shaft speed rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Hp to gal (kg/hr)	Cool- ing medium	Temp °F (°C) air oil water	Barometer inch Hg (kPa)
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Maximum Available Power — Two Hours 8th (III-1) Gear									
51.21 (23.27)	2490 (11.11)	4.69 (7.34)	2499	7.67	2.525 (9.551)	0.502 (0.345)	12.50 (2.475)	177 (80.4)	65 (23.8)

75% of Pull at Maximum Power — Two Hours 8th (III-1) Gear									
26.05 (19.43)	1908 (8.49)	5.12 (8.24)	2586	6.54	2.321 (8.765)	0.624 (0.508)	11.25 (2.212)	177 (80.4)	55 (21.8)

50% of Pull at Maximum Power — Two Hours 8th (III-1) Gear									
17.87 (13.31)	1272 (5.66)	5.27 (8.46)	2705	4.39	1.890 (7.194)	0.741 (0.491)	9.40 (1.863)	177 (80.4)	56 (21.8)

50% of Pull at Reduced Engine Speed — Two Hours 10th (III-2) Gear									
17.86 (13.32)	1271 (5.65)	5.27 (8.46)	1695	4.05	1.426 (5.398)	0.500 (0.341)	12.52 (2.466)	175 (79.4)	52 (20.0)

MAXIMUM POWER IN SELECTED GEARS									
30.64 (22.8)	4257 (19.3)	2.70 (4.34)	2500	14.95	6th (II-2) Gear	176 (80.0)	55 (21.7)	56 (21.8)	28.74 (19.05)

51.58 (23.3)	3275 (14.76)	5.62 (9.02)	2501	10.45	7th (II-3) Gear	177 (80.1)	54 (21.2)	60 (23.8)	29.72 (19.86)
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51.74 (23.67)	2544 (11.31)	4.68 (7.53)	2499	7.95	8th (III-1) Gear	177 (80.4)	54 (21.2)	60 (23.8)	28.70 (19.82)
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50.24 (22.3)	1871 (8.52)	6.06 (9.75)	2501	5.95	9th (II-4) Gear	177 (80.4)	55 (21.2)	60 (23.8)	28.69 (19.88)
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29.59 (22.07)	1440 (6.46)	7.71 (12.41)	2499	4.75	10th (III-2) Gear	177 (80.4)	56 (21.3)	61 (23.8)	28.60 (19.85)
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27.04 (20.14)	1020 (4.54)	9.94 (16.06)	2500	5.55	11th (III-3) Gear	177 (80.4)	56 (21.3)	61 (23.8)	28.60 (19.85)
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Department of Agricultural Engineering

Dates of Test: October 1 to 8, 1985

Manufacturer: FIAT TRATTORI S.p.A. Via Picciolla Mirandola 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8420 Fuel weight 7.011 lb/gal (0.840 kg/l) Oil SAE 15W40 API service classification SF-CD To motor 2.215 gal (8.379 l) Drained from motor 1.968 gal (7.449 l) Transmission and final drive lubricant: Heston M&PS 705106016 fluid Total time engine was operated 40.0 hours.

ENGINE: Make Fiat (VECO) Diesel Type three cylinder vertical Serial No. 8055 06*206-012765 Crankshaft lengthwise Rated rpm 2500 Bore and stroke 3.937" x 4.528" (100 mm x 115 mm) Compression ratio 17 to 1 Displacement 165 cu in (2710 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow cartridge Fuel filter one paper element Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. 45-66DT-12*420698* Truss width rear 50.0" (1270 mm) to 60.2" (1530 mm) front 54.5" (1380 mm) to 71.6" (1820 mm) Wheel base 74.9" (1902 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 51.9" (1310 mm) Vertical distance above roadway 26.7" (678 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 0.7 (1.2) second 1.1 (1.8) third 1.4 (2.3) fourth 1.9 (3.0) fifth 2.5 (4.0) sixth 2.9 (4.7) seventh 3.7 (6.0) eighth 4.7 (7.6) ninth 6.0 (9.7) tenth 7.5 (12.1) eleventh 9.6 (15.3) twelfth 15.2 (24.3) reverse 2.2 (3.5), 3.4 (5.4), 4.1 (6.6), 6.5 (10.5) Clutch single dry disc operated by foot pedal Brakes wet disc operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 141" (3.58 m) left 141" (3.58 m) on concrete surface without brake) right 158" (4.01 m) left 158" (4.01 m) Turning space diameter (on concrete surface with brake applied) right 290" (7.37 m) left 290" (7.37 m) on concrete surface without brake) right 324" (8.23 m) left 324" (8.23 m) Power take-off 540 rpm at 2199 engine rpm Unladen tractor mass 4270 lb (1937 kg).

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin F. Christensen, Dean and Director

Crankshaft Speed (rpm)	2000	2250	2000	1750	1400	1200
Pull—lb (N)	25.44 (11.1)	27.90 (12.5)	30.09 (13.3)	31.60 (14.0)	31.60 (14.0)	31.20 (13.8)
Increase in Pull %	0	10	18	24	25	25
Power—Hp (kW)	51.74 (27.6)	51.75 (27.2)	29.59 (22.0)	27.04 (20.1)	25.08 (17.7)	19.00 (14.1)
Speed—Mph (km/h)	4.68 (7.74)	4.18 (6.72)	5.69 (9.16)	5.21 (8.40)	2.75 (4.43)	2.28 (3.63)
Skip %	7.95	8.75	9.41	9.98	9.88	9.88

Maximum Available Power—Two Hours	95.0	95.0
75% of Pull at Maximum Power—Ten Hours		95.0
50% of Pull at Maximum Power—Two Hours		95.5
50% of Pull at Reduced Engine Speed—Two Hours		98.5
Brakeless in 12th (11-6) gear	87.0	

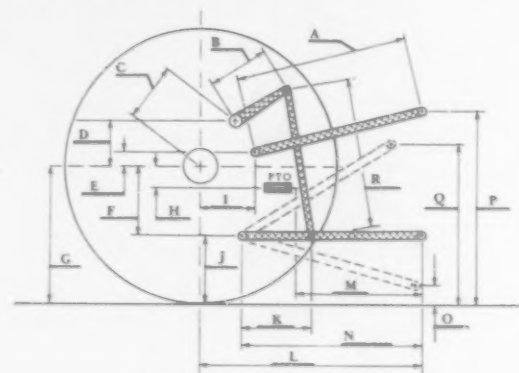
Power HP (kW)	Drawline ft (m)	Speed ft/min (m/s)	Crank speed rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Group No./Yr.
51.27 (37.92)	27.12 (12.06)	4.75 (4.48)	2490 (11.08)	5.517 (5.133)	0.564 (2.643)	177 (80.6)
59	70	28.65				
29.29 (21.86)	31.48 (14.80)	5.49 (5.42)	2654 (12.25)	14.97 (13.7)	176 (80.6)	58 (27.4)
51.71 (37.92)	27.12 (12.06)	4.75 (4.48)	2490 (11.25)	8.6 (7.8)	178 (80.6)	54 (27.4)
51.58 (37.96)	29.63 (13.7)	5.69 (5.75)	2500 (11.67)	7.67 (7.0)	176 (80.6)	55 (27.4)

Rate Times	Rate Times	Rate Times	Rate Times
Ballast	—No. sec. gals & gas (m³)	Two 120-200, 2, 200 (140)	Two 120-200, 2, 200 (140)
Ballast	—Liquid (m³)	5000 (2, 174 gal)	None
Ballast	—Gas from strath	None	None
Freeze Times	—No. sec. gals & gas (m³)	Freeze 7 50-200, 2, 24 (165)	Freeze 7 50-200, 2, 24 (165)
Ballast	—Liquid (m³)	None	None
Ballast	—Gas from strath	175 (2, 179 gal)	None
Height of Overburden	30 sec. 1400' max.	30 sec. 1400' max.	30 sec. 1400' max.
Static Weights with Operation—Rear	2200 lb. (1047 kg)	2200 lb. (1047 kg)	2200 lb. (1047 kg)
—Front	1900 lb. (861 kg)	1900 lb. (861 kg)	1900 lb. (861 kg)
—Total	5400 lb. (2448 kg)	5400 lb. (2448 kg)	5400 lb. (2448 kg)

Board of Tractor Test Engineers

Observed Maximum Pressure psi (kPa)	2680 (19310)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	170 (77)	
Location	hydraulic filter	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	II	*not measured
LOAD lbs (kg)	5016 (1168)	
TIME sec	1.85	
HITCH POINT MOVEMENT in (mm)		
Lowest position	10.2 (259)	
Top of timed range	54.2 (884)	
Highest position	** 55.0 (889)	
LOAD CG MOVEMENT in (mm)		
Lowest position	9.8 (249)	
Top of timed range	38.6 (980)	
Highest position	39.8 (1013)	

⁸⁸ The observed highest position, 35.0 in. (899 mm), is less than the minimum height for highest position for Car II, 36 in. (914 mm) specified by ASAE Standard S217.10.



Hitch Dimensions as Tested — No Load

	inch	mm
A	27.0	686
B	3.0	254
C	10.2	258
D	10.1	257
E	10.8	275
F	5.9	150
G	20.9	531
H	0.5	14
I	4.8	121
J	15.0	381
K	14.5	369
L	32.1	815
M	23.0	584
N	32.7	827
O	8.0	203
P	54.0	864
Q	34.4	873
R	17.0	432

**Heaton 45-66 DT Diesel**

NEBRASKA TRACTOR TEST 1560—HESSTON 55-66 FIAT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank- shaft speed rpm	Fuel Consumption gal/hr (l/hr)	Temp °F (°C)	Barometer sea Hg (kPa)
		gal/hr (l/hr)	Air wet bulb	Air dry bulb

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed—814 rpm)				
45.78 (34.14)	2500 (11.413)	5.015 (0.280)	15.10 (2.991)	187 (86.0)
				64 (23.8)
				75 (28.8)

Standard Power Take-off Speed (540 rpm) — One Hour				
44.84 (33.44)	2199 (10.376)	2.741 (0.239)	0.427 (2.221)	16.50 (83.7)
				180 (81.7)
				64 (23.7)
				75 (27.3)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

40.55 (30.00)	2592 (10.072)	2.661 (0.280)	0.460 (2.984)	15.16 (83.7)
				182 (83.3)
				65 (23.9)
				75 (27.8)

0.90 (0.60)	2756 (12.71)	0.864 (0.271)	—	173 (78.3)
				65 (23.3)
				74 (27.4)

20.98 (15.63)	2694 (12.42)	1.676 (12.634)	0.558 (0.285)	12.52 (2.913)
				175 (81.3)
				65 (23.3)
				74 (27.4)

45.76 (34.12)	2501 (11.634)	5.074 (0.285)	0.469 (2.913)	14.89 (83.3)
				186 (86.6)
				66 (23.3)
				74 (27.4)

10.58 (7.89)	2721 (12.71)	1.255 (0.504)	0.474 (2.913)	14.72 (80.6)
				177 (80.6)
				66 (23.3)
				74 (27.4)

30.95 (23.07)	2650 (12.07)	2.102 (0.288)	0.474 (2.899)	14.72 (80.6)
				177 (80.6)
				66 (23.3)
				74 (27.4)

44.78 (33.47)	2852 (13.39)	6.546 (0.312)	15.77 (2.514)	178 (81.8)
				66 (23.4)
				74 (27.8)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Temp °F (°C)	Barometer sea Hg (kPa)
				Air wet bulb	Air dry bulb

MAXIMUM AVAILABLE POWER — Two Hours 8th (III-1) Gear

58.39 (43.83)	2551 (11.33)	5.64 (0.88)	2501 (11.301)	0.83 (0.327)	2.959 (2.334)
					12.98 (83.4)
					186 (85.3)
					60 (21.7)
					71 (26.1)

75% OF Pull at Maximum Power — Ten Hours 8th (III-1) Gear

50.77 (37.84)	1904 (8.67)	6.06 (9.75)	2630 (12.101)	4.89 (0.332)	2.404 (2.521)
					12.80 (83.7)
					183 (83.7)
					64 (23.7)
					77 (28.4)

50% OF Pull at Maximum Power — Two Hours 8th (III-1) Gear

21.15 (15.77)	1269 (5.64)	6.25 (10.06)	2571 (12.00)	5.51 (0.377)	1.877 (2.219)
					0.619 (41.5)
					11.27 (20.6)
					100 (45.8)
					85 (26.8)

50% OF Pull at Reduced Engine Speed — Two Hours 10th (III-2) Gear

21.15 (15.76)	1268 (5.64)	6.25 (10.06)	1732 (7.84)	5.28 (0.296)	1.490 (2.796)
					14.18 (82.8)
					181 (82.8)
					70 (25.8)
					87 (26.6)

MAXIMUM POWER IN SELECTED GEARS

55.01 (40.80)	4608 (20.30)	2.85 (4.58)	2535 (11.30)	14.93 (0.327)	5th (I-4) Gear
					181 (82.5)
					55 (20.4)
					61 (22.1)
					28.82 (97.32)

57.05 (42.62)	3976 (17.88)	5.49 (8.62)	2499 (11.30)	11.90 (0.327)	6th (II-2) Gear
					182 (83.1)
					54 (22.2)
					6 (16.3)
					28.82 (97.32)

57.57 (42.62)	3186 (14.17)	4.42 (7.12)	2502 (11.30)	9.00 (0.296)	7th (II-3) Gear
					183 (83.6)
					55 (20.4)
					28.82 (97.32)

58.74 (43.83)	2576 (14.88)	5.64 (9.08)	2499 (11.30)	9.00 (0.296)	8th (III-1) Gear
					185 (85.0)
					59 (21.5)
					70 (25.8)
					28.78 (97.19)

57.12 (42.62)	1921 (8.53)	7.33 (11.78)	2500 (11.30)	5.20 (0.296)	9th (II-4) Gear
					185 (85.0)
					59 (21.5)
					64 (23.8)
					28.81 (97.28)

57.64 (42.67)	1581 (7.68)	8.95 (14.17)	2500 (11.30)	4.56 (0.296)	10th (III-2) Gear
					183 (83.6)
					56 (21.1)
					66 (23.8)
					28.31 (97.28)

Department of Agricultural Engineering

Dates of Test: April 15 to 29, 1985

Manufacturer: FIAT TRATTORI, S.p.A. Via Piccollella Mirandola 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60° 60°F (15/15°C) 0.8302 Fuel weight 6.979 lb/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 2.259 gal (8.475 l) Drained from motor 1.962 gal (7.426 l) Transmission and final drive lubricant API 305 hydraulic fluid Total time engine was operated 44.5 hours.

ENGINE: Make Fiat/IVECO Diesel Type three cylinder vertical Serial No. 8035.06*206-023147* Crankshaft lengthwise Raised rpm 2500 Bore and stroke 3.937" x 4.528" (100 mm x 113 mm) Compression ratio 17 to 1 Displacement 165 cu in (2710 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow paper cartridge Fuel filter one paper element Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type standard Serial No. 55-66 1/2 12*577416* Truss width rear 56.1" (1425 mm) to 75.8" (1925 mm) front 55.5" (1410 mm) to 75.2" (1910 mm) Wheel base 85.6" (2175 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 27.8" (707 mm) Vertical distance above roadway 32.5" (825 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.1 (1.7) second 1.6 (2.6) third 2.0 (3.2) fourth 2.5 (4.0) fifth 3.2 (5.1) sixth 3.8 (6.2) seventh 4.7 (7.6) eighth 5.9 (9.5) ninth 7.5 (12.0) tenth 9.0 (14.5) eleventh 11.1 (17.8) twelfth 17.6 (28.4) reverse 2.8 (4.4), 4.3 (6.8), 5.2 (8.4), 8.3 (13.4) Clutch dry disc operated by foot pedal Brakes wet disc operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 126" (3.20 m) left 126" (3.20 m) (on concrete surface without brake) right 145" (3.68 m) left 145" (3.68 m) Turning space diameter (on concrete surface with brake applied) right 261" (6.63 m) left 261" (6.63 m) (on concrete surface without brake) right 299" (7.59 m) left 299" (7.59 m) Power take-off 540 rpm at 2199 engine rpm Unladen tractor mass 5290 lb (2400 kg).

LUGGING ABILITY IN 8th (III-1) GEAR

Crankshaft Speed rpm	2490	2255	1994	1741	1501	1245
Pull—lb (kN)	2576 (11.48)	2602 (12.46)	2647 (13.33)	2921 (14.46)	3354 (16.92)	3357 (16.84)

Increase in Pull %	0	9	18	26	50	50
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Power—Hp (kW)	38.74 (28.89)	37.70 (28.12)	35.99 (26.84)	33.28 (24.81)	29.50 (22.00)	24.52 (18.14)
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Speed—mph (km/h)	5.64 (9.08)	5.05 (8.12)	4.43 (7.13)	3.84 (6.18)	3.50 (5.61)	2.75 (4.40)
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Sip %	6.80	7.68	8.40	9.00	9.35	9.25
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TRACTOR SOUND LEVEL WITHOUT CAB

Maximum Available Power—Two Hours	95.5
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75% of Pull at Maximum Power—Ten Hours	94.0
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50% of Pull at Maximum Power—Two Hours	93.0
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50% of Pull at Reduced Engine Speed—Two Hours	90.0
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Bystander in 12th (III-4) gear	85.5
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TREE BALLAST AND WEIGHT

Rear Three Ballast	With Ballast	Without Ballast
—No., size, ply & psi (kPa)	Two 14.9-20, 6, 16 (110)	Two 16.9-20, 6, 16 (110)
—Liquid (mch)	680 lb (218 kg)	None
—Case Iron (mch)	None	None
Front Three Ballast	With Ballast	Without Ballast
—No., size, ply & psi (kPa)	Two 9.5L-15, 8, 36 (250)	Two 9.5L-15, 8, 36 (250)
—Liquid (mch)	None	None
—Case Iron (mch)	72 lb (33 kg)	None
Height of Driver	19.5 in (495 mm)	19.5 in (495 mm)
Static Weight with Operator—Rear	6995 lb (2130 kg)	5735 lb (1694 kg)
—Front	1875 lb (850 kg)	1730 lb (785 kg)
—Total	6670 lb (2980 kg)	5465 lb (2479 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2875 (19820)
Location	remote outlet
Hydraulic oil temperature °F (°C)	171 (77)
Location	pump inlet

Maximum Lift Capacity	Lift Capacity for Transport
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QUICK ATTACH CATEGORY	no	
LOAD lbs (kg)	11	
TIME sec	4464 (2025)	
HITCH POINT MOVEMENT in (mm)		

Lowest position	9.2 (214)	
Top of timed range	55.2 (843)	
Highest position	33.5 (922)	
LOAD CG MOVEMENT in (mm)		

Lowest position	8.9 (226)	
Top of timed range	54.5 (876)	
Highest position	58.1 (968)	

*Implement load capacity for transport purposes not specified by manufacturer.		
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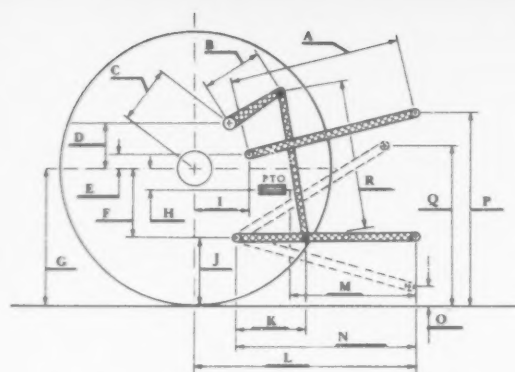
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 152°F (66.7°C). Six gears were chosen between 15% slip and 10 mph (16.1 km/h).

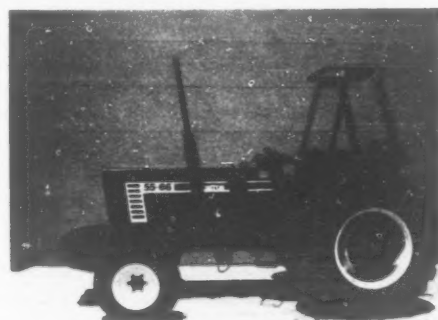
We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1800, June 14, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load



Hesston 55-66 Fiat Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Ostvedt, Dean and Director

	inch	mm
A	31.3	794
B	10.0	255
C	13.8	350
D	11.7	297
E	10.4	264
F	8.1	206
G	0.6	16
H	6.9	176
I	18.5	470
J	16.8	428
K	58.2	971
L	25.6	650
M	35.4	900
N	8.0	203
O	37.5	953
P	37.0	940
Q	23.0	584
R		

NEBRASKA TRACTOR TEST 1531—HESSTON 60-66DT FIAT DIESEL ALSO HESSTON 60-66 FIAT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	Bhp/hr (kW)	Temp. °C Cooling medium	Air wet bulb	Air dry bulb	Barometer in. Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed — Two hours (PTO Speed—614 rpm)							
51.49 (38.40)	2500	3.168 (11.990)	0.429 (0.261)	16.26 (17.203)	193 (89.4)	66 (19.1)	28.95 (21.8)
Standard Power Take-off Speed (340 rpm) — One Hour							
48.51 (36.18)	2199	3.832 (10.717)	0.407 (0.248)	17.13 (17.373)	190 (87.9)	66 (18.9)	28.96 (21.8)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

46.46 (34.64)	2654	2.958 (11.120)	0.441 (0.268)	15.81 (17.115)	183 (83.9)	66 (18.9)	28.95 (21.8)
0.00 (0.00)	2758	0.976 (3.696)	—	—	171 (77.2)	66 (18.6)	28.95 (21.8)
23.73 (17.70)	2708	1.897 (7.100)	0.558 (0.339)	12.51 (2.465)	175 (79.4)	66 (18.9)	28.95 (21.8)
51.80 (38.63)	2500	3.226 (12.211)	0.434 (0.264)	16.06 (17.165)	192 (88.6)	66 (18.9)	28.95 (21.8)
11.97 (8.93)	2755	1.449 (5.487)	0.845 (0.514)	8.26 (1.827)	171 (77.2)	66 (18.9)	28.95 (21.8)
35.15 (26.21)	2676	2.417 (9.150)	0.480 (0.292)	14.54 (2.804)	178 (80.8)	65 (18.3)	28.95 (21.8)
Av St	28.18 2671	2.151 0.532	0.324 (2.582)	13.11 (81.2)	178 66	75 (23.8)	29.00 (97.5)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbf (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	Bhp/hr (kW)	Temp. °C Cool- ing med	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
Maximum Available Power — Two Hours 8th (III-1) Gear										
44.67 (33.11)	3051 (13.48)	5.53 (8.89)	2499	5.37	3.147 (11.913)	0.491 (0.299)	14.19 (2.796)	182 (83.3)	61 (16.1)	29.06 (20.8)
75% of Pull at Maximum Power — Ten Hours 8th (III-1) Gear										
56.11 (26.92)	2275 (10.12)	5.95 (9.56)	2649	5.85	2.713 (10.279)	0.525 (0.319)	13.30 (2.619)	195 (89.4)	72 (22.3)	28.72 (96.99)
50% of Pull at Maximum Power — Two Hours 8th (III-1) Gear										
24.89 (18.56)	1521 (6.76)	6.14 (9.88)	2696	2.59	2.186 (8.276)	0.615 (0.371)	11.38 (2.242)	178 (80.8)	61 (16.1)	29.08 (98.16)
50% of Pull at Reduced Engine Speed — Two Hours 10th (III-2) Gear										
24.87 (18.55)	1519 (6.76)	6.14 (9.88)	1747	2.56	1.720 (6.513)	0.485 (0.294)	14.46 (2.848)	180 (82.2)	61 (15.8)	29.05 (98.08)

MAXIMUM POWER IN SELECTED GEARS

40.49 (30.20)	5515 (24.53)	2.75 (4.43)	2554	14.75	5th (I-4) Gear	186 (85.1)	60 (15.6)	75 (23.9)	28.91 (97.62)
43.33 (32.11)	4682 (20.81)	3.47 (5.56)	2501	9.25	6th (II-2) Gear	191 (88.1)	61 (16.1)	76 (24.4)	28.90 (97.59)
43.64 (32.33)	3759 (16.72)	4.35 (7.01)	2499	6.93	7th (II-3) Gear	192 (88.6)	61 (16.1)	77 (25.0)	28.89 (97.56)
45.51 (33.94)	3087 (13.73)	5.53 (8.90)	2502	5.37	8th (III-1) Gear	184 (84.2)	62 (16.7)	71 (21.7)	29.06 (98.13)
43.14 (32.17)	2263 (10.07)	7.15 (11.51)	2499	4.06	9th (II-4) Gear	192 (88.9)	62 (16.7)	79 (26.1)	28.88 (97.52)
43.04 (32.0)	1856 (8.26)	8.70 (14.00)	2499	5.30	10th (III-2) Gear	192 (88.9)	62 (16.7)	78 (23.8)	28.88 (97.52)

Department of Agricultural Engineering

Dates of Test: August 28-September 5, 1984

Manufacturer: FIAT TRATTORI, S.p.A. Via Picciolla Mirandola, 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8377 Fuel weight 6.975 lb/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 1.842 gal (6.972 l) Drained from motor 1.554 gal (5.807 l) Transmission and final drive lubricant API 303 hydraulic fluid Total time engine was operated 44.0 hours.

ENGINE: Make Fiat/IVECO Diesel Type three cylinder vertical Serial No. 8035.05*200-003704* Crankshaft lengthwise Rated rpm 2500 Bore and stroke 4.094" x 4.527" (104 mm x 115 mm) Compression ratio 17 to 1 Displacement 178.8 cu in (2931 ml) Starting system 12 volt Lubrication pressure Air cleaner oil bath Oil filter one full flow cartridge Fuel filter two paper elements Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. 60-66DT*385014* Tread width rear 56.1" (1423 mm) to 75.8" (1925 mm) front 56.9" (1445 mm) to 73.8" (1875 mm) Wheel base 83.4" (2119 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 31.5" (799 mm) Vertical distance above roadway 32.5" (825 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.1 (1.7) second 1.7 (2.7) third 2.1 (3.3) fourth 2.5 (4.1) fifth 3.2 (5.1) sixth 3.9 (6.3) seventh 4.8 (7.7) eighth 5.9 (9.5) ninth 7.4 (11.8) tenth 9.1 (14.6) eleventh 11.1 (17.9) twelfth 17.2 (27.6) reverse 1.1 (1.7), 1.7 (2.7), 2.1 (3.3), 2.5 (4.1), 3.2 (5.1), 3.9 (6.3), 4.8 (7.7), 5.9 (9.5), 7.4 (11.8), 9.1 (14.6), 11.1 (17.9), 17.2 (27.6) Clutch dry disc operated by foot pedal Brakes wet disc operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 158" (4.01 m) left 158" (4.01 m) (on concrete surface without brake) right 188" (4.78 m) left 188" (4.78 m) Turning space diameter (on concrete surface with brake applied) right 325.5" (8.27 m) left 325.5" (8.27 m) (on concrete surface without brake) right 385.5" (9.79 m) left 385.5" (9.79 m) Power take-off 540 rpm at 2199 engine rpm Unladen tractor mass 5700 lbs (2586 kg).

LUGGING ABILITY IN 8th (III-1) GEAR

Crankshaft Speed rpm	2502	2259	1992	1753	1490	1245
Pull—lbs (kN)	3087 (13.7)	3201 (14.24)	3358 (14.94)	3473 (15.45)	3584 (15.94)	3485 (15.50)
Increase in Pull %	0	4	9	13	16	13
Power—Hp (kW)	45.51 (33.46)	42.49 (31.49)	39.17 (28.71)	35.58 (26.3)	31.52 (23.36)	25.35 (18.90)
Speed—Mph (km/h)	5.53 (8.90)	4.98 (8.01)	4.37 (7.04)	3.84 (6.18)	3.28 (5.27)	2.75 (4.39)
Slip %	5.37	5.61	5.85	6.22	6.46	6.22

Front Wheel Drive

TRACTOR SOUND LEVEL WITHOUT CAB Engaged dB(A) Disengaged dB(A)

Maximum Available Power—Two Hours	94.0	94.5
75% of Pull at Maximum Power—Ten Hours		95.0
50% of Pull at Maximum Power—Two Hours		94.5
50% of Pull at Reduced Engine Speed—Two Hours		89.0
Bystander in 12th (III-4) gear		85.5

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Slip shut- rpm	Fuel Consumption gal/hr (kg/hr)	Temp. °F (°C)	Temp. °F (°C)	Temp. °F (°C)	Temp. °F (°C)	Temp. °F (°C)
Maximum Available Power — Two Hours 8th (III-1) Gear									
44.89 (33.46)	2997 (13.33)	5.62 (9.06)	2499 (17.6)	4.59 (16.9)	5.161 (11.087)	0.491 (0.299)	14.20 (2.59)	188 (86.7)	65 (18.1)
MAXIMUM POWER IN SELECTED GEARS									
38.27 (28.54)	6424 (28.52)	2.23 (3.60)	2625 (17.6)	14.97 (55.4)	4th (III-1) Gear	181 (82.5)	56 (13.3)	71 (21.7)	28.93 (97.68)
45.57 (33.46)	3038 (13.5)	5.63 (9.07)	2502 (17.6)	4.56 (16.9)	8th (III-1) Gear	187 (85.1)	64 (17.6)	74 (23.3)	29.06 (88.1)

TIRES, BALLAST AND WEIGHT

Rear Tires	With Ballast	Without Ballast
No. size ply & psi (kPa)	Two 16.9-28 R 10 (110)	Two 16.9-28 R 10 (110)
Ballast	542 lb (245 kg)	None
— Equal track	410 lb (186 kg)	None
— Low front track	None	None
Front Tires	With Ballast	Without Ballast
No. size ply & psi (kPa)	Two 9.5-24 R 20 (140)	Two 9.5-24 R 20 (140)
Ballast	None	None
— Equal track	38 lb (17 kg)	None
— Low front track	None	None
Height of Drawbar	18 in (457 mm)	18 in (457 mm)
Static Weight with Operator	3253 lb (1477 kg)	3730 lb (1692 kg)
— Rear	2225 lb (1009 kg)	2150 lb (975 kg)
— Front	744 lb (336 kg)	580 lb (262 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2725	18790
Location	remote	
Hydraulic oil temperature °F (°C)	181	83
Location	pump inlet	
QUICK ATTACH CATEGORY	II	*not measured
LOAD lbs (kg)	3920	1778
TIME sec	2.02	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.1	368
Top of timed range	36.3	921
Highest position	36.8	933
LOAD CG MOVEMENT in (mm)		
Lowest position	11.6	294
Top of timed range	38.1	968
Highest position	38.7	983

*Implement load capacity for transport purposes not specified by manufacturer.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 167°F (74.8°C). Six gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1531, December 21, 1984.

LOUIS I. LEVITICUS

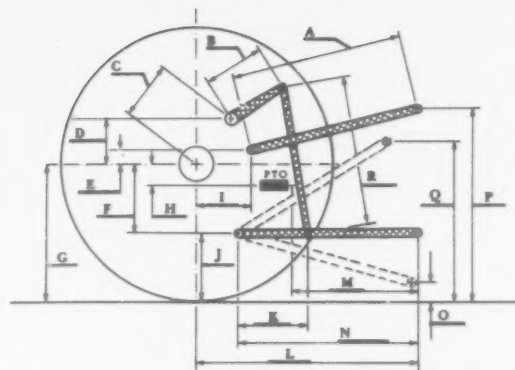
Engineer-in-Charge

K. VON BARGEN

W. E. SPLINTER

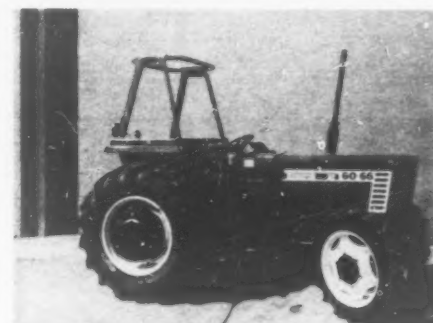
L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	50.3	768
B	10.0	255
C	13.8	350
D	11.7	297
E	10.4	264
F	8.1	206
G	25.5	647
H	0.6	15
I	6.9	176
J	17.4	441
K	16.8	428
L	38.2	971
M	25.6	650
N	35.4	900
O	8.0	203
P	36.4	924
Q	36.0	914
R	22.1	562



John Deere 60-66DT Diesel

NEBRASKA TRACTOR TEST 1561—HESSTON 70-66DT FIAT DIESEL ALSO HESSTON 70-66 FIAT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hhp (kW)	Crank shaft speed (rpm)	Fuel Consumption		Temperature °F (°C)				Barometer inHg (kPa)
		gal/hr (L)	Bhp to PTO (kW)	Hip to PTO (kW)	Cooling medium	Air inlet temp	Air outlet temp	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed)—1800 rpm								
62.72 (46.77)	2500	3.708 (14.037)	0.415 (0.274)	16.91 (12.732)	150	80	75	29.81 (101.21)
Standard Power Take-off Speed (1800 rpm)—One Hour								
62.71 (46.76)	2500	3.645 (13.769)	0.406 (0.267)	17.29 (12.621)	150	80	75	28.77 (101.15)
Standard Power Take-off Speed (540 rpm)—One Hour								
60.90 (44.42)	2100	3.896 (14.621)	0.597 (0.242)	17.57 (12.462)	150	50	75	28.82 (101.07)
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
56.55 (41.60)	2645	3.452 (12.926)	0.428 (0.266)	16.52 (12.09)	180	61	76	— (101.4)
50.06 (36.86)	2752	3.145 (11.926)	0.428 (0.266)	16.52 (12.09)	180	61	76	— (101.4)
38.28 (28.26)	2851	2.182 (8.185)	0.534 (0.325)	15.08 (10.75)	180	60	75	— (101.4)
62.25 (45.46)	2500	3.705 (14.026)	0.416 (0.271)	17.29 (12.621)	150	80	76	— (101.2)
44.55 (32.76)	2692	1.659 (6.281)	0.807 (0.491)	15.08 (10.75)	180	60	74	— (101.4)
41.90 (30.86)	2852	2.754 (10.349)	0.455 (0.277)	15.34 (10.92)	180	60	76	— (101.4)
Ar 60 (44.42)	2645	2.476 (9.172)	0.510 (0.336)	15.67 (11.496)	185	60	75	28.78 (101.2)

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hhp (kW)	Drawbar pull lb (kg)	Speed mph (km/h)	Crank shaft speed (rpm)	Wp gal/hr (L)	Fuel Consumption		Temp. °F (°C)				Barometer inHg (kPa)
					Wp gal/hr (L)	Bhp to PTO (kW)	Air inlet	Air outlet	Oil inlet	Oil outlet	
Maximum Available Power — Two Hours 8th (III-1) Gear											
54.22 (40.45)	5575 (17.89)	5.69 (17.89)	2500	4.50 (17.02)	3.704 (2.780)	14.64 (10.60)	195 (89.4)	62 (16.2)	67 (19.2)	29.80 (101.2)	
75% of Pull at Maximum Power — Two Hours 8th (III-1) Gear											
45.91 (33.74)	2708 (12.05)	6.08 (17.74)	2651	3.57 (13.29)	3.225 (2.395)	15.15 (10.92)	186 (85.6)	55 (13.4)	54 (13.2)	28.77 (101.2)	
50% of Pull at Maximum Power — Two Hours 8th (III-1) Gear											
30.61 (22.86)	1800 (8.16)	6.25 (17.89)	2897	2.55 (9.64)	2.601 (1.927)	11.54 (8.21)	181 (82.8)	45 (11.4)	47 (13.2)	28.84 (101.2)	
50% of Pull at Reduced Engine Speed — Two Hours 10th (III-2) Gear											
50.61 (37.56)	1790 (8.06)	6.38 (17.89)	1751	2.60 (9.64)	2.063 (1.529)	14.34 (10.40)	180 (82.8)	46 (11.4)	48 (13.2)	28.78 (101.2)	
MAXIMUM POWER IN SELECTED GEARS											
45.45 (33.66)	8520 (17.89)	2.25 (17.89)	2500	14.74 (17.89)	6th (III-1) Gear	185	45	48	28.75 (101.2)	—	
52.65 (39.21)	6689 (28.75)	2.95 (17.89)	2695	9.08 (17.89)	5th (III-1) Gear	188	45	47	28.76 (101.2)	—	
55.91 (40.26)	5595 (24.81)	3.61 (17.89)	2499	7.11 (17.89)	4th (III-1) Gear	191	45	47	28.78 (101.2)	—	
55.74 (40.07)	4471 (17.89)	4.51 (17.89)	2501	5.46 (17.89)	3th (III-1) Gear	191	45	47	28.76 (101.2)	—	
54.85 (40.06)	3611 (17.89)	5.69 (17.89)	2501	4.50 (17.89)	2th (III-1) Gear	188	45	48	28.75 (101.2)	—	
52.45 (39.11)	2662 (17.89)	7.55 (17.89)	2499	5.19 (17.89)	1th (III-1) Gear	191	45	47	28.76 (101.2)	—	
52.55 (39.02)	2290 (17.89)	8.92 (17.89)	2502	2.62 (17.89)	10th (III-2) Gear	186	45	48	28.75 (101.2)	—	

Department of Agricultural Engineering

Date of Test: April 17 to May 1, 1985

Manufacturer: FIAT TRATTORI, S.p.A. Via
Picciola Mirandola 72-41100, Modena, Italy

FUEL, OIL, AND TIME: Fuel No. 2 Diesel
Cetane No. 48.5 (rating taken from oil company's
inspection data) Specific gravity converted to 60°
60°F (15.5°C) 0.8582 Fuel weight 6.979 lb/gal
(0.836 kg/L) Oil SAE 15W-40 API service classification
M, S, CC, CD To motor 5.066 gal (11.607
L) Drained from motor 2.695 gal (10.202 L) Transmission
and final drive lubricant API 805 hydraulic fluid Total time engine was operated 51.5
hours.

ENGINE: Make Fiat/VECO Diesel Type four
cylinder vertical Serial No. 8045.06*206-019357*
Crankshaft lengthwise Rated rpm 2500 Bore and
stroke 3.937" x 4.527" (100 mm x 115 mm)
Compression ratio 17 to 1 Displacement 220.5 cu
in (3.613 m) Starting system 12 volt Lubrication
pressure Air cleaner two paper elements Oil filter
one full flow paper cartridge Fuel filter two paper
elements Muffler service Cooling medium tempera-
ture control one thermostat.

CHASSIS: Type front wheel Serial No.
70-66 DT/12*439665* Wheel width rear 30.1"
(760 mm) to 78.7" (2000 mm) front 60.2" (1530
mm) to 77.2" (1960 mm) Wheel base 88.5" (2248
mm) Center of gravity (without operator or ballast,
with maximum tread, with fuel tank filled and tractor
serviced for operation) Horizontal distance
forward from center line of rear wheels 54.0" (867
mm) Vertical distance above roadway 36.5" (927
mm) Horizontal distance from center of rear wheel
tread 0" (0 mm) to the right/left Hydraulic control
system direct engine drive Transmission selective
gear fixed ratio Advertised speeds mph (km/h):
first 1.1 (1.7) second 1.6 (2.6) third 2.0 (3.2) fourth
2.4 (3.9) fifth 3.1 (5.1) sixth 3.6 (5.8) seventh 4.6
(7.4) eighth 5.7 (9.3) ninth 7.5 (11.8) tenth 8.9
(14.3) eleventh 10.8 (17.5) twelfth 17.5 (27.8)
reverse 2.8 (4.5), 4.3 (6.9), 5.5 (8.8), 8.4 (13.5) Clutch
dry disc operated by foot pedal Brakes wet disc
operated by two foot pedals which can be locked
together Steering hydraulic Turning radius on
concrete surface with brake applied right 150°
(16.4 m) left 150° (16.4 m) on concrete surface
without brake right 190° (4.83 m) left 190° (4.83
m) Turning space diameter on concrete surface
with brake applied right 550" (8.8 m) left 550"
(8.8 m) on concrete surface without brake right
592" (9.96 m) left 592" (9.96 m) Power take-off 540
rpm at 2190 engine rpm and 1000 rpm at 2381
engine rpm 1960 tractor mass 8510 lb (2953
kg).

LUGGING ABILITY IN 8th (III-1) GEAR

Crankshaft Speed rpm	2501	2255	1997	1750	1491	1245	1005
Pull—lb (kg)	3611 (16.36)	4003 (18.16)	4092 (18.56)	4227 (19.20)	4421 (19.85)	4600 (20.87)	5067 (22.80)
Increase in Pull %	0	11	13	17	22	24	30
Power—Hhp (kW)	54.85 (40.26)	54.55 (40.15)	49.51 (36.57)	44.52 (32.90)	39.23 (28.90)	33.45 (24.65)	24.05 (17.80)
Speed—Mph (km/h)	5.69 (9.18)	5.11 (8.22)	4.52 (7.27)	3.93 (6.30)	3.36 (5.40)	2.79 (4.50)	2.27 (3.64)
Slip %	8.30	8.58	8.85	9.28	9.59	9.59	8.85

Front Wheel Drive

TRACTOR SOUND LEVEL WITHOUT CAB

	Disengaged dB(A)	Engaged dB(A)
Maximum Available Power—Two Hours	94.0	94.3
75% of Pull at Maximum Power—Two Hours	94.0	94.0
50% of Pull at Maximum Power—Two Hours	94.0	94.0
50% of Pull at Reduced Engine Speed—Two Hours	94.0	94.0
Brakeless in 12th (III-2) gear	94.0	—

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hhp (kW)	Drawbar pull lb (kg)	Speed mph (km/h)	Crank shaft speed (rpm)	Slip %	Fuel Consumption		Temp. °F (°C)				Barometer inHg (kPa)
					gal/hr (L)	Bhp to PTO (kW)	Air inlet	Air outlet	Oil inlet	Oil outlet	
Maximum Available Power — Two Hours 8th (III-1) Gear											
53.54 (39.82)	5644 (25.62)	5.51 (18.25)	2499	8.47 (8.87)	3.807 (14.06)	0.492 (0.336)	14.48 (10.3)	195 (89.4)	65 (15.6)	72 (22.2)	28.96 (101.2)
MAXIMUM POWER IN SELECTED GEARS											
47.73 (35.45)	6217 (27.85)	2.88 (9.44)	2670	14.94	5th (III-1) Gear		182 (81)	45 (7.2)	48 (10.0)	28.75 (101.6)	
54.40 (40.07)	5695 (25.84)	3.52 (11.49)	2500	6.24	6th (III-1) Gear		191 (88)	45 (7.2)	48 (10.0)	28.75 (101.6)	

TIRES, BALLAST AND WEIGHT

Rate Tires	Ballast	Without Ballast
Rate Tires	Two 18 x 30, 6, 16 (110)	Two 18 x 30, 6, 16 (110)
Ballast	—None	—None
From Tires	—None	—None
Ballast	—None	—None
Height of Drawbar	35.5 in (902 mm)	35.5 in (902 mm)
Basic Weight with Operator—Rear	5290 lb (2400 kg)	5290 lb (2400 kg)
Ballast	—None	—None
From Tires	4750 lb (2155 kg)	4750 lb (2155 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2050 (140.5)
Location	remote outlet
Hydraulic oil temperature °F (°C)	174 (79)
Location	pump inlet
MAXIMUM LIFT CAPACITY	
QUICK ATTACH CATEGORY	80
LOAD in (kg)	3675 (2572)
TIME sec	5.86
HITCH POINT MOVEMENT in (mm)	
Lowest position	15.5 (158)
Top of timed range	36.5 (922)
Highest position	36.4 (923)
LOAD CG MOVEMENT in (mm)	
Lowest position	15.2 (155)
Top of timed range	37.4 (951)
Highest position	37.2 (950)

*Minimum load capacity for transport purposes are specified by manufacturer.
**The observed power range 25.1 to 28.7 kW is less than the minimum power range for Cat 11, 24 to 30 kW specified by ASAE Standard S217.10.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 162°F (72°C). Seven gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1561, June 14, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers

LUGGING ABILITY IN 8th (III-1) GEAR

Crankshaft Speed rpm	2502	2251	2000	1749	1498	1247	1000
Pull—lb (kg)	5647 (25.62)	5052 (22.92)	4663 (21.17)	4102 (18.60)	3596 (16.31)	3112 (14.10)	2650 (12.02)
Increase in Pull %	0	8	11	15	21	26	31
Power—hp (kW)	54.64 (40.74)	52.95 (39.47)	48.18 (35.81)	45.05 (33.10)	50.56 (37.75)	52.81 (39.46)	24.14 (17.90)
Speed—mph (km/h)	5.02 (8.08)	5.02 (8.08)	4.45 (7.16)	3.86 (6.21)	3.29 (5.29)	2.73 (4.39)	2.24 (3.60)
Slip %	5.96	6.61	7.00	7.26	7.77	8.02	7.15
TRACTOR SOUND LEVEL WITH CAB	dB(A)						
Maximum Available Power—Two Hours	80.0						
75% of Pull at Maximum Power—Ten Hours	80.5						
50% of Pull at Maximum Power—Two Hours	81.0						
50% of Pull at Reduced Engine Speed—Two Hours	75.0						
Reynolds in 12th (III-4) gear	85.5						

TIRES, BALLAST AND WEIGHT	With Ballast	Without Ballast
Rear Tires —No. and ply & psi (kPa) —Capacit. (lb) —Car. (lb) (kg)	Two 18.4-30 S, 16 (110) 210 lb (95 kg) None	Two 18.4-30 S, 16 (110) None None
Front Tires —No. and ply & psi (kPa) —Capacit. (lb) —Car. (lb) (kg)	Two T 50-15 S, 40 (275) None 55 lb (25 kg)	Two T 50-15 S, 40 (275) None None
Height of Drawbar	21 in (533 mm)	21 in (533 mm)
Static Weight with Operator—Rear —Front —Total	5340 lb (2422 kg) 2455 lb (1115 kg) 7795 lb (3537 kg)	4050 lb (1836 kg) 2365 lb (1075 kg) 6415 lb (2919 kg)

THREE POINT HITCH PERFORMANCE

Overhaul Maximum Pressure (psi) (kPa)	27.50 (1896)
Location	rearward outlet
Hydraulic oil temperature °F (°C)	185 (85)
Location	pump inlet
Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no
CATEGORY	II
LOAD (lb) (kg)	5212 (2364)
TIME sec	2.71
HITCH POINT MOVEMENT (in) (mm)	
Lowest position	11.3 (287)
Top of travel range	35.5 (897)
Highest position	56.1 (1427)
LOAD CG MOVEMENT (in) (mm)	
Lowest position	13.0 (330)
Top of travel range	37.5 (947)
Highest position	58.4 (1483)

*Implement load capacity for transport purposes not specified by manufacturer.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

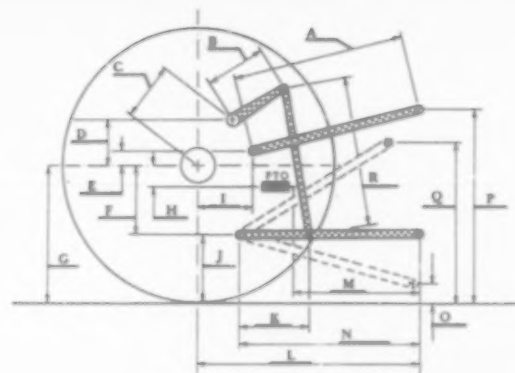
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power test, the fuel temperature at the injection pump return was maintained at 154°F (67.8°C). Six gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1562, June 14, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	27.1	689
B	10.0	255
C	15.8	399
D	11.8	300
E	9.8	250
F	7.9	200
G	27.5	699
H	0.6	16
I	15.0	380
J	19.8	502
K	17.7	450
L	45.5	1150
M	29.2	740
N	37.8	960
O	8.0	203
P	38.8	984
Q	36.0	914
R	23.5	597



Hesston 70-90 Flat Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omevdi, Dean and Director

NEBRASKA TRACTOR TEST 1532—HESSTON 80-66DT FIAT DIESEL ALSO HESSTON 80-66 FIAT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hhp (kW)	Crash shaft speed rpm	Fuel Consumption			Temperature °F (°C)				Barometer in. Hg (kPa)
		gal/hr (L/hr)	hp/hr (kW/hr)	hp/acre (kW/ha)	Cooling medium	Air wet	Air dry	Soil	

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed—Two Hours (PTO Speed—1000 rpm)									
70.45 (51.52)	2500 (15.87)	6.142 (0.245)	0.410 (0.158)	17.01 (12.7)	168 (69.6)	80 (31.7)	75 (29.1)	28.99 (97.68)	

Standard Power Take-off Speed (1000 rpm)—One Hour									
68.91 (51.16)	2500 (15.87)	6.001 (0.245)	0.405 (0.158)	17.22 (12.7)	190 (77.2)	80 (31.7)	70 (27.2)	28.99 (97.68)	

Standard Power Take-off Speed (540 rpm)—One Hour									
65.20 (48.42)	2100 (14.02)	5.704 (0.241)	0.396 (0.152)	17.60 (12.9)	192 (77.3)	84 (32.8)	81 (31.7)	28.95 (97.68)	

VARYING POWER AND FUEL CONSUMPTION—Two Hours

82.82 (60.76)	2615 (16.21)	5.756 (0.234)	0.418 (0.161)	16.87 (12.6)	184 (73.6)	82 (31.7)	75 (29.1)	28.95 (97.68)	
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80.00 (58.06)	2720 (18.02)	5.157 (0.182)	0.397 (0.152)	16.87 (12.6)	184 (73.6)	82 (31.7)	75 (29.1)	28.95 (97.68)	
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82.58 (59.24)	2705 (17.26)	5.409 (0.216)	0.519 (0.204)	15.44 (11.5)	176 (70.0)	82 (31.7)	80 (31.7)	28.95 (97.68)	
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71.87 (51.22)	2561 (16.88)	4.229 (0.160)	0.415 (0.161)	16.87 (12.6)	191 (76.8)	82 (31.7)	80 (31.7)	28.95 (97.68)	
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16.99 (12.22)	2737 (18.02)	5.805 (0.216)	0.767 (0.294)	9.99 (7.3)	168 (69.6)	82 (31.7)	80 (31.7)	28.95 (97.68)	
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47.92 (35.71)	2568 (17.71)	5.055 (0.182)	0.441 (0.168)	15.80 (11.5)	180 (72.6)	82 (31.7)	79 (29.1)	28.95 (97.68)	
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As (24.6)	2658 (18.67)	5.751 (0.234)	0.455 (0.173)	14.88 (11.0)	177 (69.6)	82 (31.7)	78 (29.1)	28.95 (97.68)	
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DRAWBAR PERFORMANCE

(Front Wheel Drive Disengaged)

Power Hhp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crash shaft speed rpm	Fuel Consumption	Temperature °F (°C)				Barometer in. Hg (kPa)
					gal/hr (L/hr)	hp/hr (kW/hr)	hp/acre (kW/ha)	Air wet	

Maximum Available Power—Two Hours 8th (III-1) Gear									
62.20 (46.58)	4290 (30.95)	5.48 (4.01)	2500 (15.87)	6.75 (0.254)	4.159 (1.574)	0.446 (0.168)	14.90 (11.0)	184 (73.6)	62 (23.9)

75% of Pull at Maximum Power—Two Hours 8th (III-1) Gear									
50.99 (37.58)	3187 (22.88)	5.95 (4.38)	2670 (18.02)	5.41 (0.198)	3.547 (1.325)	0.490 (0.182)	14.21 (10.6)	179 (70.0)	61 (23.9)

50% of Pull at Maximum Power—Two Hours 8th (III-1) Gear									
34.70 (25.82)	2145 (15.52)	6.10 (4.50)	2685 (18.02)	5.45 (0.200)	3.746 (1.398)	0.515 (0.191)	12.90 (9.4)	172 (69.6)	60 (23.9)

30% of Pull at Reduced Engine Speed—Two Hours 10th (III-2) Gear									
34.77 (25.85)	2159 (15.55)	5.10 (3.75)	2400 (16.76)	5.14 (0.182)	2.250 (0.835)	0.447 (0.168)	15.19 (11.1)	179 (70.0)	60 (23.9)

MAXIMUM POWER IN SELECTED GEARS

55.52 (40.85)	7245 (51.23)	2.87 (2.12)	2658 (18.67)	14.95 (5.43)	5th (II-4) Gear	181 (67.5)	80 (31.7)	69 (26.4)	28.95 (97.68)
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59.52 (44.23)	6595 (48.56)	3.57 (2.64)	2495 (18.02)	12.21 (4.51)	6th (II-2) Gear	185 (68.7)	85 (32.3)	71 (27.2)	28.84 (97.59)
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60.29 (44.89)	5258 (38.89)	4.31 (3.19)	2500 (18.02)	8.45 (3.09)	7th (II-3) Gear	185 (68.7)	85 (32.3)	71 (27.2)	28.84 (97.59)
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62.75 (46.77)	4297 (31.71)	5.47 (4.01)	2490 (18.02)	6.96 (2.55)	8th (III-1) Gear	185 (68.7)	80 (31.7)	68 (26.4)	28.90 (97.68)
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60.81 (45.15)	5195 (38.21)	5.14 (3.75)	2505 (18.02)	4.68 (1.71)	9th (II-4) Gear	184 (67.5)	84 (31.7)	70 (26.4)	28.83 (97.59)
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61.50 (45.68)	2650 (19.38)	8.70 (6.43)	2501 (18.02)	5.80 (2.12)	10th (III-2) Gear	184 (67.5)	84 (31.7)	70 (26.4)	28.83 (97.59)
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Department of Agricultural Engineering

Dates of Test: October 1 to 14, 1984

Manufacturer: FIAT TRATTORI, S.p.A.
Pio della Mirandola, 72-41100 Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 48.8 rating taken from oil company's
inspection data. Specific gravity converted to
60.66°F (15.35°C) 0.8575. Fuel weighs 6.973 lb/gal
(0.816 kg/L). Oil SAE 15W-40 API service
classification SE, SE, CC, CD. Total motor 2.793 gal
(10.571 L). Drained from motor 2.564 gal (9.747 L).
Transmission and final drive lubricants API 303
hydraulic fluid. Total time engine was operated
45.5 hours.

ENGINE: Make FiatVECO Diesel Type four
cylinder vertical Serial No. 8045 05/265-001804
Crashshaft lengthwise. Rated rpm 2500. Bore and
stroke 4.094" x 4.527" (104 mm x 115 mm).
Compression ratio 17 to 1. Displacement 258.3
cu in (4.230 L). Starting system 12 volt. Lubri-
cation pressure. Air cleaner two paper elements.
Oil filter one full flow cartridge. Fuel filter two
paper elements. Muffler vertical. Cooling me-
dium temperature control one thermostat.

CHASSIS: Type front wheel assist. Serial No.
80-66DT 19056641. Tread width rear 59.1" (1500
mm) to 78.7" (2000 mm) front 60.2" (1530 mm) to
77" (1956 mm). Wheel base 88.5" (2248 mm). Cen-
ter of gravity (without operator or ballast, with
minimum tread, with fuel tank filled and tractor
serviced for operation). Horizontal distance for-
ward from center-line of rear wheels 54.0" (1371
mm). Vertical distance above roadways 36.5" (927
mm). Horizontal distance from center of rear wheel
tread 0" (0 mm) to the right/left. Hydraulic con-
trol system direct engine drive. Transmission se-
lective gear fixed ratio. Advertised speeds mph
(km/h): First 1.1 (1.8), second 1.7 (2.7), third 2.0 (3.2),
fourth 2.5 (4.0), fifth 3.3 (5.3), sixth 3.9 (6.3), sev-
enth 4.8 (7.7), eighth 5.9 (9.5), ninth 7.0 (11.2), tenth
9.1 (14.6), eleventh 11.1 (17.8), twelfth 13.2 (21.3),
reverse 1.1 (1.8), 1.7 (2.7), 2.0 (3.2), 2.3 (3.7), 3.3
(5.3), 3.9 (6.3), 4.8 (7.7), 5.9 (9.5), 7.0 (11.2), 9.1
(14.6), 11.1 (17.8), 13.2 (21.3). Clutch dry disc
operated by foot pedal. Brakes wet disc operated by
two foot pedals which can be locked together.

Steering: hydrostatic. Turning radius (on con-
crete surface with brake applied) right 150" (4.04
m) left 150" (4.04 m). (on concrete surface without
brake) right 190" (4.83 m) left 190" (4.83 m). Turn-
ing space diameter (on concrete surface with brake
applied) right 150" (4.04 m) left 150" (4.04 m). (on
concrete surface without brake) right 190" (4.83
m) left 190" (4.83 m). Power take-off 540 rpm at
2100 engine rpm and 1000 rpm at 2501 engine
rpm. Unladen tractor mass 6335 lb (2864 kg).

LUGGING ABILITY IN 8th (III-1) GEAR

Crashshaft Speed rpm	2499	2252	2001	1746	1484	1255	993
Pull—lb (kN)	4297 (19.11)	4476 (19.91)	4600 (20.46)	4645 (21.34)	4776 (21.24)	4864 (21.65)	4929 (21.92)
Increase in Pull %	0	4	7	13	11	13	-6
Power—Hhp (kW)	62.75 (46.77)	58.72 (43.29)	55.48 (40.86)	48.90 (36.46)	41.01 (30.58)	34.72 (25.89)	23.47 (17.50)
Speed—Mph (km/h)	5.47 (8.81)	4.92 (7.92)	4.36 (7.02)	3.79 (6.09)	3.22 (5.18)	2.67 (4.30)	2.18 (3.52)
Slip %	6.86	6.99	7.25	7.65	7.65	7.76	6.47

TRACTOR SOUND LEVEL WITHOUT CAB

Front Wheel Drive		Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours		95.5	95.5
75% of Pull at Maximum Power—Ten Hours		94.0	94.0
50% of Pull at Maximum Power—Two Hours		95.5	95.5
50% of Pull at Reduced Engine Speed—Two Hours		96.0	96.0
Boulder in 12th (III-4) gear		89.0	

DRAWBAR PERFORMANCE

(Front Wheel Drive Engaged)

Power Hhp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crash shaft speed rpm	Fuel Consumption	Temperature °F (°C)				Barometer in. Hg (kPa)
					gal/hr (L/hr)	hp/hr (kW/hr)	hp/acre (kW/ha)	Air wet	

Maximum Available Power—Two Hours 8th (III-1) Gear									
62.21 (46.59)	4175 (30.56)	5.59 (4.08)	2501 (15.87)	5.91 (0.205)	4.180 (1.574)	0.460 (0.173)	14.88 (11.0)	185 (73.6)	62 (23.9)

MAXIMUM POWER IN SELECTED GEARS

47.83 (35.62)	7986 (58.22)	2.25 (1.62)	2619 (18.02)	14.85 (5.43)	4th (II-1) Gear	178 (64.6)	59 (22.3)	66 (25.3)	29.00 (97.91)
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62.83 (46.85)	4217 (30.56)	5.59 (4.08)	2499 (18.02)	5.81 (2.12)	8th (III-1) Gear	185 (67.5)	59 (22.3)	62 (23.9)	29.00 (97.91)
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TIRES, BALLAST AND WEIGHT

Rear Tires	—No. size, ply & psi (kPa)	With Ballast	Without Ballast
Ballast	—No. size, ply & psi (kPa)	Two 18.4-50, 6, 16 (1.0)	Two 18.4-50, 6, 16 (1.0)
	—Liquid (each)	890 lb (401 kg)	None
	—Cast iron (each)	610 lb (277 kg)	None
Front Tires	—No. size, ply & psi (kPa)	Two 12.4-24, 6, 24 (1.6)	Two 12.4-24, 6, 24 (1.6)
	—Liquid (each)	None	None
	—Cast iron (each)	47 lb (21 kg)	None
Height of Drawbar		20 in (510 mm)	20 in (510 mm)
Rear Weight with Operator—Rear	—Front	6605 lb (3007 kg)	4205 lb (1907 kg)
	—Total	3595 lb (1677 kg)	7510 lb (3409 kg)
	—Total	9600 lb (4354 kg)	8715 lb (3954 kg)



Hesston 80-66DT Diesel

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 165°F (73°C). Six gears were chosen between 15% slip and 10 mph (16.1 km/h). During final inspection, several vertical marks were found on the wall of the front cylinder.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1532, December 21, 1984.

LOUIS I. LEVITICUS

Engineer-in-Charge

K. VON BARGEN

W. E. SPLINTER

L. L. BASHFORD

Board of Tractor Test Engineers

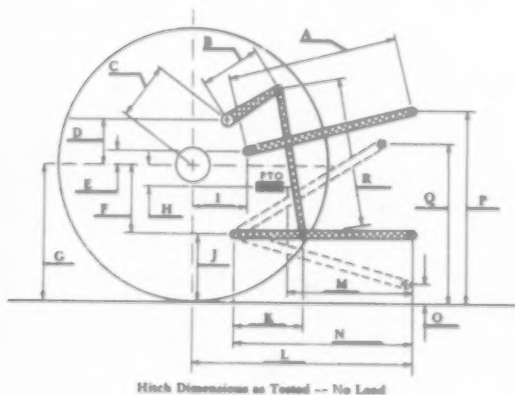
THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2525 *** 17410	
Location	remote	
Hydraulic oil temperature °F (°C)	184 84	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	no	
CATEGORY	II	*not measured
LOAD lbs (kg)	5194 2356	
TIME sec	7.04	
HITCH POINT MOVEMENT in (mm)		
Lowest position	14.6 371	
Top of timed range	**56.6 930	
Highest position	56.6 930	
LOAD CG MOVEMENT in (mm)		
Lowest position	15.4 391	
Top of timed range	56.9 937	
Highest position	56.8 937	

*Implement load capacity for transport purposes not specified by manufacturer.

**The observed power 22" (560 mm) does not meet the minimum power range 24 in. (610 mm) specified by ASAE Standard S217.10.

***The observed maximum pressure was outside the range specified by the manufacturer 2000-2800 psi (137.9-193.0 kPa).



Hitch Dimensions as Tested -- No Load

	inch	mm
A	52.4	822
B	10.0	255
C	13.8	350
D	11.7	297
E	10.4	264
F	8.1	206
G	27.9	708
H	0.6	15
I	6.3	160
J	19.8	502
K	21.3	541
L	38.9	989
M	27.0	686
N	36.7	932
O	8.0	203
P	38.8	984
Q	32.4	822
R	25.8	654

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Ousvold, Dean and Director

NEBRASKA TRACTOR TEST 1563—HESSTON 80-90 FIAT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)				Barometer inches Hg (kPa)
		gal/hr (lit)	lb/hp-hr (kg/kW-hr)	Hp-hp/gal (kW-kW/l)	Cooling medium	Air wet bulb	Air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed — Two hours (PTO Speed—1000 rpm)									
70.86 (52.84)	2500	4.115 (15.730)	0.405 (0.247)	17.22 (3.393)	189 (87.2)	62 (16.5)	75 (23.9)	28.75 (97.10)	
Standard Power Take-off Speed (1000 rpm) — One Hour									
69.25 (51.44)	2581	3.972 (15.036)	0.400 (0.244)	17.43 (3.435)	189 (86.9)	63 (17.0)	75 (23.9)	28.76 (97.12)	
Standard Power Take-off Speed (540 rpm) — One Hour									
65.40 (48.77)	2190	3.683 (13.941)	0.393 (0.239)	17.76 (3.499)	188 (86.5)	64 (17.8)	75 (23.6)	28.78 (97.18)	
VARYING POWER AND FUEL CONSUMPTION — Two Hours									
64.09 (47.79)	2660	3.850 (14.576)	0.419 (0.255)	16.64 (3.279)	186 (85.6)	63 (17.2)	76 (24.4)	—	
0.00 (0.00)	2732	1.238 (4.685)	—	—	178 (80.8)	65 (18.6)	76 (24.2)	—	
52.52 (39.29)	2699	2.411 (9.126)	0.518 (0.315)	15.49 (2.857)	180 (81.9)	65 (18.6)	75 (23.6)	—	
70.49 (52.36)	2501	4.207 (15.926)	0.417 (0.253)	16.75 (3.401)	189 (87.2)	63 (17.2)	76 (24.2)	—	
16.59 (12.22)	2724	1.788 (6.767)	0.761 (0.465)	9.17 (1.806)	178 (81.1)	63 (17.2)	76 (24.4)	—	
48.51 (36.02)	2674	3.111 (11.778)	0.450 (0.274)	15.55 (3.079)	182 (83.3)	64 (17.8)	76 (24.4)	—	
Av St	58.65 (28.81)	2668	2.700 (10.470)	0.500 (0.300)	15.90 (3.230)	181 (83.3)	63 (17.2)	76 (24.2)	28.78 (97.17)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption			Temp °F (°C)			Barom. inches Hg (kPa)
					gal/hr (lit)	lb/hp-hr (kg/kW-hr)	Hp-hp/gal (kW-kW/l)	Cool- ing med	Air wet bulb	Air dry bulb	
Maximum Available Power — Two Hours 8th (III-1) Gear											
60.77 (45.12)	4096 (18.2)	5.56 (8.95)	2499 (8.95)	5.90 (8.95)	4.118 (15.580)	0.475 (0.280)	14.76 (2.907)	190 (87.5)	59 (14.7)	75 (23.6)	29.00 (97.81)
75% of Pull at Maximum Power — Ten Hours 8th (III-1) Gear											
50.21 (37.44)	3113 (13.85)	6.05 (9.73)	2667 (9.73)	4.87 (7.51)	5.564 (21.01)	0.496 (0.301)	14.09 (2.773)	188 (86.4)	61 (16.2)	75 (23.6)	28.70 (96.90)
50% of Pull at Maximum Power — Two Hours 8th (III-1) Gear											
54.22 (40.25)	2075 (9.25)	6.18 (9.95)	2696 (9.95)	5.00 (7.94)	2.780 (10.707)	0.548 (0.346)	12.28 (2.419)	181 (82.0)	55 (12.8)	64 (17.8)	29.02 (97.88)
50% of Pull at Reduced Engine Speed — Two Hours 10th (III-2) Gear											
54.23 (40.25)	2074 (9.25)	6.19 (9.96)	1748 (5.98)	2.87 (4.59)	2.855 (10.772)	0.456 (0.277)	15.32 (3.017)	180 (82.0)	56 (13.3)	71 (21.7)	29.00 (97.81)
MAXIMUM POWER IN SELECTED GEARS											
55.08 (40.87)	7525 (32.37)	2.82 (4.54)	2570 (9.74)	14.90 (23.3)	5th (I-4) Gear			181 (82.0)	52 (11.1)	56 (13.3)	28.98 (97.80)
57.92 (43.16)	6505 (29.03)	3.45 (5.55)	2499 (9.19)	10.95 (17.06)	6th (II-2) Gear			189 (86.9)	58 (14.4)	71 (21.7)	29.06 (98.11)
59.84 (44.62)	5132 (22.85)	4.57 (7.36)	2500 (9.19)	7.78 (12.41)	7th (II-3) Gear			189 (87.2)	58 (14.4)	72 (22.2)	29.05 (98.10)
61.32 (45.68)	4150 (18.46)	5.56 (8.95)	2498 (9.19)	5.87 (9.21)	8th (III-1) Gear			190 (87.8)	59 (15.0)	75 (23.9)	29.01 (97.96)
59.40 (44.29)	3088 (13.73)	7.21 (11.61)	2499 (9.19)	4.20 (6.61)	9th (III-4) Gear			190 (87.3)	59 (15.0)	73 (22.8)	29.04 (98.06)
59.72 (44.33)	2547 (11.55)	8.79 (14.15)	2499 (9.19)	5.58 (8.81)	10th (III-2) Gear			189 (86.9)	59 (15.0)	74 (23.3)	29.03 (98.01)

Department of Agricultural Engineering

Date of Test: April 22 to May 7, 1985

Manufacturer: FIAT TRATTORI, S.p.A. Via Picciola, Mirandola 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8584 Fuel weight 6.981 lb/gal (0.837 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 2.975 gal (11.261 l) Drained from motor 2.579 gal (9.762 l) Transmission and final drive lubricant API 305 hydraulic fluid Total time engine was operated 40.5 hours.

ENGINE: Make Fiat/IVECO Diesel Type four cylinder vertical Serial No. 8045.05*205-024124* Crankshaft lengthwise Rated rpm 2500 Bore and stroke 4.094" x 4.527" (104 mm x 115 mm) Compression ratio 17 to 1 Displacement 258.5 cu in (4240 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow cartridge Fuel filter two paper elements Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type standard Serial No. *80-90/12*527470* Tread width rear 65" (1600 mm) to 82.7" (2100 mm) front 55.1" (1400 mm) to 74.8" (1900 mm) Wheel base 92.2" (2342 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 30.7" (781 mm) Vertical distance above roadway 38.2" (970 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Adversarial speeds mph (km/h) first 1.1 (1.7) second 1.7 (2.7) third 2.0 (3.2) fourth 2.5 (4.0) fifth 3.2 (5.2) sixth 3.9 (6.3) seventh 4.8 (7.7) eighth 6.0 (9.6) ninth 7.6 (12.2) tenth 9.2 (14.8) eleventh 11.3 (18.2) twelfth 18.0 (28.9) reverse 2.8 (4.5), 4.5 (6.9), 5.2 (8.4), 8.4 (13.3), Clutch dry disc operated by foot pedal Brakes wet disc hydraulically operated by two foot pedals which can be locked together Sourcing hydrostatic Turning radius (on concrete surface with brake applied) right 154" (3.94 m) left 154" (3.94 m) on concrete surface without brake right 154" (3.91 m) left 154" (3.91 m) Turning space diameter (on concrete surface with brake applied) right 276" (7.01 m) left 276" (7.01 m) on concrete surface without brake right 516" (8.03 m) left 516" (8.03 m) Power take-off 540 rpm at 2199 engine rpm and 1000 rpm at 2581 engine rpm Unladen tractor mass 7130 lb (3234 kg).

LUGGING ABILITY IN 3rd (III-1) GEAR

Crankshaft Speed rpm	2498	2256	1997	1748	1492	1246	998
Pull—lb (kW)	4150 (18.46)	4520 (19.22)	4431 (19.71)	4690 (20.60)	4777 (21.25)	4818 (21.43)	4006 (17.82)
Increase in Pull %	0	4	7	12	15	16	-3
Power—hp (kW)	61.52 (45.60)	57.69 (43.02)	52.25 (38.94)	47.61 (35.31)	41.78 (31.16)	35.16 (26.22)	23.75 (17.71)
Speed—mph (km/h)	5.56 (8.95)	5.01 (8.06)	4.42 (7.12)	3.86 (6.21)	3.28 (5.38)	2.74 (4.40)	2.22 (3.58)
Slip %	5.87	6.19	6.92	6.58	7.09	7.09	5.80

TRACTOR SOUND LEVEL WITH CAB	dB(A)
Maximum Available Power—Two Hours	80.0
75% of Pull at Maximum Power—Ten Hours	81.0
50% of Pull at Maximum Power—Two Hours	81.0
50% of Pull at Reduced Engine Speed—Two Hours	74.5
Bystander in 12th (III-4) gear	86.0

TIRES, BALLAST AND WEIGHT		
Base Tire	With Ballast	Without Ballast
	No. size, ply & psi (kPa) —Liquid (each) —Cast Iron (each)	Two 18.4-50, 6, 16 (110) 656 lb (298 kg) 990 lb (447 kg)
Front Tire	With Ballast	Without Ballast
	No. size, ply & psi (kPa) —Liquid (each) —Cast Iron (each)	Two 7.50-16, 6, 40 (275) None None
Height of DriveShaft	20 in (510 mm)	20 in (510 mm)
Static Weight with Operator—Rear	7055 lb (3197 kg)	4940 lb (2241 kg)
—Front	2450 lb (1102 kg)	2570 lb (1175 kg)
—Total	9465 lb (4299 kg)	7510 lb (3396 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2700 (18620)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	175 (79)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	II	*not measured
LOAD lbs (kg)	4898 (2222)	
TIME sec	2.17	
HITCH POINT MOVEMENT in (mm)		
Lowest position	10.5 (262)	
Top of timed range	54.4 (1374)	
Highest position	56.0 (1410)	
LOAD CG MOVEMENT in (mm)		
Lowest position	10.2 (259)	
Top of timed range	56.6 (1430)	
Highest position	59.9 (1513)	

*Implement load capacity for transport purposes not specified by manufacturer

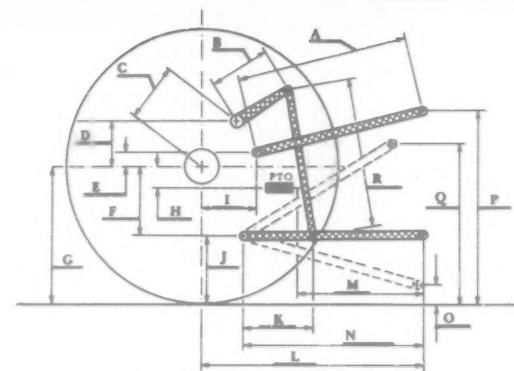
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 148°F (64.4°C). Six gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1543, June 19, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	27.4	695
B	10.0	255
C	15.8	350
D	11.8	300
E	9.8	250
F	7.9	200
G	27.0	686
H	0.6	16
I	15.0	380
J	19.1	486
K	17.7	450
L	43.3	1100
M	23.2	590
N	37.8	960
O	8.0	203
P	58.1	968
Q	36.0	914
R	22.9	581



Heaton 80-90 Fiat Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omsvedt, Dean and Director

NEBRASKA TRACTOR TEST 1580—HESSTON 100-90 FIAT DIESEL 15 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/hr)	Bhp (kW)	Hp-hr (kWh)	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches Hg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed—Two hours (FTO Speed—1050 rpm)								
91.52 (67.24)	2500	5.725 (21.67)	0.439 (1.65)	15.98 (11.69)	190 (140.0)	65 (17.2)	75 (23.1)	28.84 (97.39)

Standard Power Take-off Speed (1900 rpm)—One Hour								
90.57 (66.54)	2409	5.578 (21.18)	0.452 (1.68)	16.24 (11.98)	196 (147.2)	65 (17.2)	74 (23.1)	28.52 (97.66)

Standard Power Take-off Speed (540 rpm)—One Hour								
87.16 (64.99)	2124	5.159 (19.45)	0.415 (1.57)	16.96 (12.41)	199 (149.0)	66 (18.7)	75 (23.8)	29.00 (97.93)

VARYING POWER AND FUEL CONSUMPTION—Two Hours

81.66 (60.00)	2625	5.199 (19.68)	0.446 (1.67)	15.71 (11.58)	190 (140.0)	64 (17.8)	75 (23.8)	—
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41.77 (31.15)	2603	5.520 (21.58)	0.557 (2.13)	12.58 (9.24)	182 (135.0)	64 (17.3)	74 (23.3)	—
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91.50 (67.08)	2501	5.712 (21.62)	0.439 (1.65)	15.98 (11.69)	197 (147.2)	66 (18.9)	77 (23.0)	—
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21.20 (15.81)	2725	2.632 (9.96)	0.870 (3.32)	8.06 (5.92)	178 (131.0)	65 (18.3)	75 (23.9)	—
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62.05 (45.26)	2661	4.223 (15.90)	0.477 (1.80)	14.69 (10.79)	189 (140.0)	65 (18.3)	75 (23.9)	—
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Av 49.66 (36.81)	2657	3.940 (14.85)	0.540 (2.03)	12.93 (9.48)	185 (138.0)	66 (18.3)	75 (23.9)	28.95 (97.73)
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DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Bhp (kW)	Hp-hr (kWh)	Cooling medium	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)
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Maximum Available Power—Two Hours 11th (III-1) Gear											
77.98 (58.15)	4602 (20.45)	6.55 (10.23)	2500	4.89 (18.75)	5.727 (21.67)	0.515 (1.93)	15.62 (11.43)	193 (142.0)	45 (12.2)	54 (15.7)	28.88 (97.52)

75% of Pull at Maximum Power—Ten Hours 11th (III-1) Gear											
63.16 (47.10)	5487 (24.51)	6.79 (10.91)	2666	4.71 (18.71)	4.948 (18.71)	0.516 (1.93)	12.76 (9.48)	186 (138.0)	57 (16.0)	57 (16.0)	29.15 (98.45)

50% of Pull at Maximum Power—Two Hours 11th (III-1) Gear											
45.19 (33.21)	2524 (10.14)	6.97 (11.22)	2687	2.93 (11.07)	4.044 (15.10)	0.656 (2.49)	10.68 (7.88)	185 (138.0)	57 (16.0)	59 (16.8)	29.14 (98.40)

50% of Pull at Reduced Engine Speed—Two Hours 13th (III-3) Gear											
45.21 (33.22)	2323 (10.11)	6.90 (11.21)	1536	2.70 (10.43)	5.074 (18.83)	0.499 (1.87)	14.06 (10.43)	183 (136.0)	40 (10.9)	42 (11.8)	29.14 (98.40)

MAXIMUM POWER IN SELECTED GEARS

66.40 (49.52)	9911 (44.08)	2.51 (4.04)	2624	14.87	7th (II-2) Gear	184 (136.0)	44 (12.8)	48 (13.6)	28.77 (97.15)
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77.57 (57.83)	8907 (39.62)	5.27 (19.62)	2499	11.50	8th (II-3) Gear	192 (142.0)	45 (12.8)	48 (13.6)	28.78 (97.19)
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78.53 (58.58)	6920 (30.78)	4.26 (16.81)	2500	7.92	9th (II-4) Gear	192 (142.0)	44 (12.8)	49 (13.6)	28.79 (97.22)
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77.85 (58.05)	5555 (21.81)	5.45 (20.78)	2499	5.73	10th (II-5) Gear	191 (141.0)	45 (12.8)	52 (14.3)	28.83 (97.33)
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78.72 (58.70)	4646 (20.68)	6.35 (10.23)	2500	4.92	11th (III-1) Gear	193 (143.0)	45 (12.2)	54 (14.8)	28.90 (97.58)
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74.98 (55.91)	3274 (14.56)	8.59 (13.82)	2500	5.73	12th (III-2) Gear	191 (141.0)	44 (12.2)	49 (13.6)	28.80 (97.23)
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Department of Agricultural Engineering

Dates of Test: October 3 to 10, 1985

Manufacturer: FIAT TRATTORI S.p.A. Via Picciolla Mirandola 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8420 Fuel weight 7.011 lb/gal (0.840 kg/l) Oil SAE 15W40 API service classification SF-CD To motor 3.596 gal (13.61 l) Drained from motor 3.153 gal (11.85 l) Transmission and final drive lubricant Heston M&PS 705106016 fluid Total time engine was operated 57.0 hours.

ENGINE: Make Fiat-IVECO Diesel Type six cylinder vertical Serial No. 8065.06*200-042299* Crankshaft lengthwise Rated rpm 2500 Bore and stroke 3.937" x 4.527" (100 mm x 115 mm) Compression ratio 17 to 1 Displacement 331 cu in (5419 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and centrifugal pre-cleaner Oil filter two full flow cartridges Fuel filter two paper cartridges and water separator Muffler vertical Cooling medium temperature control one thermostat

CHASSIS: Type front wheel assist Serial No. 100-90DT/15748971* Tread width rear 65" (1650 mm) to 86.5" (2197 mm) front 67.5" (1714 mm) to 84.5" (2146 mm) Wheel base 93.8" (2384 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 37.1" (942 mm) Vertical distance above roadway 37.8" (960 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertized speeds mph (km/h) first 0.7 (1.1) second 0.8 (1.3) third 1.1 (1.8) fourth 1.4 (2.3) fifth 1.8 (2.9) sixth 2.0 (3.3) seventh 2.7 (4.4) eighth 3.6 (5.8) ninth 4.5 (7.3) tenth 5.6 (9.1) eleventh 6.5 (10.5) twelfth 8.7 (14.0) thirteenth 11.5 (18.5) fourteenth 14.3 (23.1) fifteenth 18.0 (29.0) reverse 0.8 (1.3), 2.7 (4.4), 8.6 (13.9) Clutch dry disc operated by foot pedal Brakes wet disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 197" (5.00 m) left 197" (5.00 m) (on concrete surface without brake) right 219" (5.56 m) left 219" (5.56 m) Turning space diameter (on concrete surface with brake applied) right 409" (10.39 m) left 409" (10.39 m) (on concrete surface without brake) right 455" (11.51 m) left 455" (11.51 m) Power take-off 540 rpm at 2124 engine rpm and 1000 rpm at 2409 engine rpm Unladen tractor mass 9540 lb (4327 kg).

LUGGING ABILITY IN 11th (III-1) GEAR

Crankshaft Speed rpm	2500	2236	2009	1747	1496	1248
Pull—lb (kN)	4646 (20.68)	3019 (12.13)	3431 (12.27)	5702 (25.36)	5755 (25.60)	5683 (25.26)
Increase in Pull %	0	8	17	23	24	22

Power—Hp (kW)	78.72 (58.70)	76.40 (56.97)	73.11 (54.52)	66.62 (49.68)	57.51 (42.69)	47.42 (35.86)
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Speed—Mph (km/h)	6.55 (10.23)	5.71 (9.19)	5.05 (8.09)	4.38 (7.05)	3.75 (6.03)	3.15 (5.06)
Slip %	4.92	5.44	5.87	6.30	6.50	6.50

Front Wheel Drive Disengaged Engaged

Maximum Available Power—Two Hours 78.0 78.5

75% of Pull at Maximum Power—Ten Hours 78.0 78.0

50% of Pull at Maximum Power—Two Hours 78.0 78.0

50% of Pull at Reduced Engine Speed—Two Hours 74.5 74.5

Bystander in 13th (III-3) gear 86.5

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Bhp (kW)	Hp-hr (kWh)	Cooling medium	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)
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Maximum Available Power—Two Hours 11th (III-1) Gear											
78.00 (58.04)	4875 (21.89)	6.07 (9.77)	2500	6.68 (25.24)	5.712 (21.67)	0.508 (1.90)	15.81 (11.69)	192 (142.0)	44 (12.2)	51 (14.0)	28.94 (97.73)

MAXIMUM POWER IN SELECTED GEARS

63.09 (47.04)	7583 (34.04)	5.20 (8.36)	2627	14.80	8th (II-3) Gear	184 (136.0)	44 (12.8)	48 (13.6)	28.78 (97.19)
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72.79 (54.01)	5620 (25.00)	5.19 (8.31)	2499	7.90	10th (II-5) Gear	192 (142.0)	45 (12.8)	52 (14.3)	28.82 (97.32)
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79.42 (59.22)	4906 (22.82)	6.07 (9.77)	2500	6.61 (25.24)	11th (III-1) Gear	193 (143.0)	45 (12.2)	54 (14.8)	28.93 (97.58)
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TIRES, BALLAST AND WEIGHT

Rear Tires	Ballast	With Ballast	Without Ballast
—No. size ply & psi (kPa)	Two 18.5-24, 8, 16 (110)	Two 18.5-24, 8, 16 (110)	Two 18.5-24, 8, 16 (110)
—Liquid (each)	500 lb (227 kg)	None	None
—Cast (each)	None	None	None

Front Tires	Ballast	With Ballast	Without Ballast
—No. size ply & psi (kPa)	Two 14.5-24, 6, 16 (110)	Two 14.5-24, 6, 16 (110)	Two 14.5-24, 6, 16 (110)
—Liquid (each)	500 lb (227 kg)	None	None
—Cast (each)	None	None	None

Height of Drawbar 17.5 in (445 mm)

Static Weight with Operator—Rear 7250 lb (3289 kg)

—Front 4350 lb (1976 kg)

—Total 11600 lb (5271 kg)

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power test, the fuel temperature at the injection pump return was maintained at 160°F (71°C). Six gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1580, December 6, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

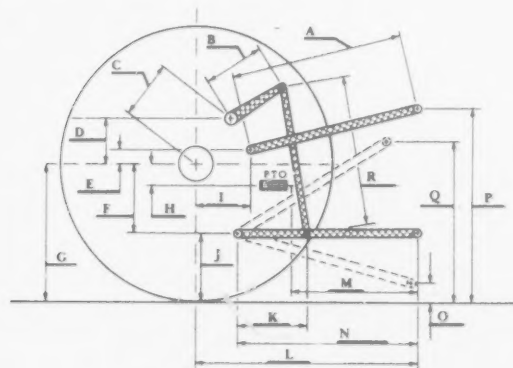
K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	** 2975 (20510)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	200 (93)	
Location	hydraulic filter	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	no II	*not measured
LOAD lbs (kg)	5852 (2654)	
TIME sec	7.94	
HITCH POINT MOVEMENT in (mm)		
Lowest position	11.7 (297)	
Top of timed range	35.7 (906)	
Highest position	56.4 (924)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.7 (297)	
Top of timed range	37.3 (947)	
Highest position	59.0 (991)	

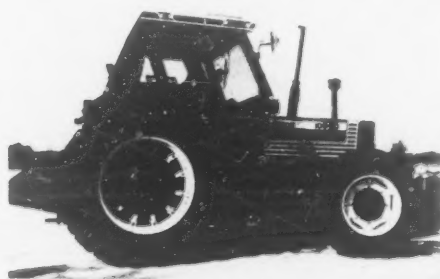
*Implement load capacity for transport purposes not specified by manufacturer.

** The observed maximum pressure at 1600 rpm, 2975 psi (20510 kPa) was outside the range specified by the manufacturer: 2700-2928 psi (186.1-20500 kPa) at 1500-1700 rpm. The observed maximum pressure at rated engine speed was 2975 psi (20510 kPa).



Hitch Dimensions as Tested — No Load

	inch	mm
A	29.0	737
B	9.0	230
C	15.3	390
D	14.1	359
E	8.1	206
F	9.3	236
G	29.2	741
H	1.3	33
I	14.4	367
J	19.9	505
K	17.5	445
L	44.1	1120
M	22.4	570
N	39.0	990
O	7.9	200
P	38.9	987
Q	34.6	879
R	28.4	721



Heaton 100-90 Diesel

NEBRASKA TRACTOR TEST 1564—HESSTON 130-90DT TURBO FIAT DIESEL
ALSO HESSTON 130-90 TURBO FIAT DIESEL
16 SPEED

Department of Agricultural Engineering

Dates of Test: April 18 to May 4, 1985

Manufacturer: FIAT TRATTORI, S.p.A. Via Piccola, Mirandola 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.3 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8382 Fuel weight 6.979 lbs/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD Turbo motor 4.183 gal (15.835 l) Drained from motor 3.523 gal (13.337 l) Transmission and final drive lubricant API 503 hydraulic fluid Total time engine was operated 47.0 hours.

ENGINE: Make Fiat/IVECO Diesel Type six cylinder vertical with turbocharger Serial No. 8065.25*010-016115* Crankshaft lengthwise Bored 2500 Bore and stroke 4.094" x 4.527" (104 mm x 115 mm) Compression ratio 16.5 to 1 Displacement 358 cu in (5861 ml) Starting system 12 volt Lubrication-pressure Air cleaner two paper elements and centrifugal pre-cleaner Oil filter two full flow cartridges Oil cooler engine coolant heat exchanger for crankcase oil Fuel filter two paper cartridges and sediment bowl Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist with duals Serial No. *130-90DT/15*256828* Tread width rear 60" (1524 mm) to 129" (3277 mm) front 64" (1625 mm) to 92" (2337 mm) Wheel base 105.1" (2670 mm) Center of gravity (without operator or ballast, with minimum axles, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 53.2" (843 mm) Vertical distance above roadway 42.5" (1080 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.9 (3.1) second 2.4 (3.8) third 2.9 (4.6) fourth 3.5 (5.7) fifth 3.9 (6.3) sixth 4.3 (7.0) seventh 4.8 (7.7) eighth 5.3 (8.6) ninth 5.8 (9.3) tenth 6.5 (10.4) eleventh 7.2 (11.6) twelfth 7.9 (12.8) thirteenth 9.8 (15.8) fourteenth 12.0 (19.3) fifteenth 14.5 (23.4) sixteenth 18.0 (29.0) reverse 1.6 (2.5), 1.9 (3.0), 2.3 (3.7), 2.8 (4.6), 3.1 (5.0), 3.5 (5.6), 3.9 (6.2), 4.2 (6.8), 4.7 (7.5), 5.2 (8.3), 5.8 (9.3), 6.4 (10.3), 7.9 (12.7), 9.6 (15.5), 11.6 (18.7), 14.4 (23.2) Clutch single dry disc hydraulically operated by foot pedal Brakes multiple wet disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 202" (5.14 m) left 204" (5.18 m) (on

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (kg/hr)	Slip hr-hr (kg/hr)	Temp. °F (°C)	Barom. in. Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION					
Rated Engine Speed — Two hours (PTO Speed—1817 rpm)					
107.48 (80.15)	2500	6.616 (25.043)	0.450 (0.261)	16.25 (3.201)	185 (84.9)
Standard Power Take-off Speed (1000 rpm) — One Hour					
106.80 (79.64)	2458	6.499 (24.603)	0.425 (0.238)	16.43 (3.237)	184 (84.5)
VARYING POWER AND FUEL CONSUMPTION — Two Hours					
95.78 (71.42)	2621	6.571 (24.113)	0.464 (0.282)	15.05 (2.962)	185 (83.9)
0.00 (0.00)	2772	2.510 (9.503)	—	—	176 (79.7)
49.57 (36.97)	2712	4.559 (17.183)	0.639 (0.389)	10.92 (2.151)	178 (81.1)
107.64 (80.26)	2501	6.641 (25.140)	0.451 (0.262)	16.21 (3.191)	185 (84.7)
25.05 (18.67)	2740	3.568 (13.506)	0.995 (0.605)	7.09 (1.182)	176 (80.0)
75.47 (54.79)	2680	5.498 (20.811)	0.522 (0.318)	15.36 (2.633)	181 (82.8)
56.58 (41.68)	2671	4.855 (18.377)	0.578 (0.312)	12.97 (2.377)	180 (82.6)

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip % hr-hr	Fuel Consumption gal/hr (kg/hr)	Temp. °F (°C)	Barom. in. Hg (kPa)
Maximum Available Power — Two Hours 8th (III-2) Gear							
90.47 (67.47)	6515 (28.95)	5.21 (8.38)	2500	1.66 (0.38)	6.541 (24.761)	15.85 (0.305)	183 (83.9)
75% of Pull at Maximum Power — Ten Hours 8th (III-2) Gear							
75.55 (54.81)	4946 (22.00)	5.58 (8.97)	2648	2.61 (0.349)	6.044 (22.878)	0.574 (0.397)	182 (83.3)
50% of Pull at Maximum Power — Two Hours 8th (III-2) Gear							
50.11 (37.37)	3275 (14.57)	5.74 (9.23)	2705	1.81 (0.233)	5.087 (19.233)	0.708 (0.431)	180 (82.2)
50% of Pull at Reduced Engine Speed — Two Hours 12th (III-4) Gear							
50.10 (37.36)	3277 (14.57)	5.73 (9.23)	1805	1.90 (0.23)	3.661 (13.858)	0.510 (0.310)	15.69 (2.698)

MAXIMUM POWER IN SELECTED GEARS

81.51 (60.63)	14850 (86.05)	2.05 (3.30)	2506 (16.1)	14.89 (96.30)	2nd (I-2) Gear	181 (82.8)	55 (11.7)	61 (16.1)	29.11 (96.30)
88.25 (65.79)	12454 (51.1)	2.66 (4.28)	2500 (16.1)	8.62 (57.93)	3rd (I-3) Gear	181 (82.8)	55 (12.8)	58 (14.4)	29.00 (97.93)
90.07 (67.17)	9987 (44.42)	3.58 (5.44)	2500 (16.1)	6.17 (37.93)	4th (I-4) Gear	181 (82.8)	55 (12.8)	58 (14.4)	29.00 (97.93)
91.11 (67.94)	9051 (40.26)	3.78 (6.08)	2500 (16.1)	5.40 (33.93)	5th (II-1) Gear	182 (83.1)	55 (12.8)	58 (14.4)	29.00 (97.93)
91.44 (68.19)	8127 (36.15)	4.22 (6.79)	2500 (16.1)	4.62 (29.93)	6th (III-1) Gear	182 (83.1)	55 (12.8)	58 (14.4)	29.00 (97.93)
91.59 (68.10)	7551 (32.79)	4.67 (7.52)	2501 (16.1)	4.14 (26.93)	7th (II-2) Gear	181 (82.8)	55 (12.8)	58 (14.4)	29.00 (97.93)
91.56 (68.28)	6594 (29.11)	5.21 (8.38)	2499 (16.1)	5.58 (35.93)	8th (III-2) Gear	185 (83.9)	61 (16.1)	68 (20.0)	29.01 (97.96)
90.31 (67.15)	5945 (26.61)	5.70 (9.17)	2500 (16.1)	5.25 (33.93)	9th (II-3) Gear	181 (82.8)	56 (13.1)	59 (15.0)	29.00 (97.93)
89.74 (66.92)	5500 (21.57)	6.55 (10.22)	2501 (16.1)	2.93 (19.22)	10th (III-3) Gear	181 (82.8)	56 (13.1)	60 (15.0)	29.01 (97.96)
88.80 (66.22)	4684 (20.85)	7.11 (11.44)	2498 (16.1)	2.44 (16.1)	11th (II-4) Gear	182 (83.1)	57 (13.9)	61 (16.1)	29.01 (97.96)
87.19 (65.02)	4132 (18.18)	7.91 (12.73)	2498 (16.1)	2.11 (13.9)	12th (III-4) Gear	182 (83.1)	58 (14.4)	62 (16.7)	29.01 (97.96)
85.41 (63.69)	3265 (14.31)	9.82 (15.80)	2499 (16.1)	1.60 (10.6)	15th (IV-1) Gear	182 (83.1)	59 (15.0)	63 (17.2)	29.01 (97.96)

LUGGING ABILITY IN 8th (III-2) GEAR

Crankshaft Speed rpm	2499	2246	2001	1748	1488	1242
Pull—lbs (AN)	6594 (29.11)	7045 (31.33)	7411 (32.97)	7565 (33.64)	7437 (33.08)	6950 (30.91)
Increase in Pull %	0	7	12	15	15	5
Power—Hp (kW)	91.56 (68.28)	87.65 (65.36)	81.94 (60.11)	72.92 (54.38)	61.07 (45.34)	47.81 (35.63)
Speed—Mph (km/h)	5.21 (8.38)	4.67 (7.51)	4.15 (6.67)	3.62 (5.82)	3.08 (4.96)	2.58 (4.15)
Slip %	3.58	3.90	4.22	4.22	4.22	3.90

Front Wheel Drive
Disengaged
dB(A)

TRACTOR SOUND LEVEL WITH CAB		
Maximum Available Power—Two Hours	77.5	77.5
75% of Pull at Maximum Power—Ten Hours		83.0
50% of Pull at Maximum Power—Two Hours		81.5
50% of Pull at Reduced Engine Speed—Two Hours		77.0
Bystander in 15th (IV-3) gear	86.0	—

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (AN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Temp °F (°C)	Barom. in. Hg (kPa)
						Wet bulb	Air dry bulb
Maximum Available Power—Two Hours 8th (III-2) Gear							
89.59 (66.66)	6552 (29.14)	5.12 (8.23)	2499 (16.1)	5.10 (3.11)	6.555 (24.015)	0.512 (0.311)	13.64 (2.606)

MAXIMUM POWER IN SELECTED GEARS

80.40 (59.96)	11805 (52.11)	2.55 (4.11)	2580 (16.1)	14.79 (96.20)	3rd (I-3) Gear	180 (82.2)	50 (10.0)	57 (13.9)	29.08 (98.20)
90.38 (67.19)	7400 (32.92)	4.58 (7.37)	2501 (16.1)	5.84 (37.93)	7th (II-2) Gear	182 (83.1)	56 (13.1)	59 (15.0)	29.00 (97.93)
90.77 (67.68)	6653 (29.59)	5.12 (8.23)	2500 (16.1)	5.14 (33.93)	8th (III-2) Gear	185 (83.9)	63 (17.2)	70 (21.1)	28.99 (97.89)

concrete surface without brake) right 241" (6.12 m) left 241" (6.12 m) Turning space diameter (on concrete surface with brake applied) right 419" (10.65 m) left 423" (10.73 m) (on concrete surface without brake) right 497" (12.63 m) left 497" (12.63 m) Power take-off 540 rpm at 2261 engine rpm and 1000 rpm at 2458 engine rpm Unladen tractor mass 14240 lb (6459 kg).

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 137°F (58.3°C). Twelve gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1564, June 19, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

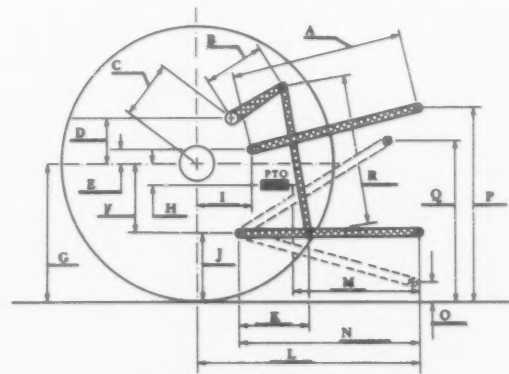
K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Base Tire	—No., size, ply & psi (kPa)	Four 18.4-38, 8, 16 (110)	Four 18.4-38, 8, 16 (110)
Ballast	—Liquid (each)	None	None
	—Cast iron (each)	61 lb (28 kg)	None
Front Tire	—No., size, ply & psi (kPa)	Two 14.9-28, 6, 20 (140)	Two 14.9-28, 6, 20 (140)
Ballast	—Liquid (each)	None	None
	—Cast iron (each)	208 lb (94 kg)	None
Height of Drawbar		18 in (457 mm)	18 in (457 mm)
Static Weight with Operator—Rear		11055 lb (5014 kg)	10810 lb (4903 kg)
—Front		5350 lb (2418 kg)	4915 lb (2229 kg)
—Total		16385 lb (7432 kg)	15725 lb (7112 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2450 (16890)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	192 (89)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	no	
LOAD lbs (kg)	11	*not measured
TIME sec	6976 (3164)	
HITCH POINT MOVEMENT in (mm)	2.01	
Lowest position	10.1 (257)	
Top of timed range	54.2 (869)	
Highest position	36.0 (914)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.3 (287)	
Top of timed range	35.9 (861)	
Highest position	35.8 (909)	

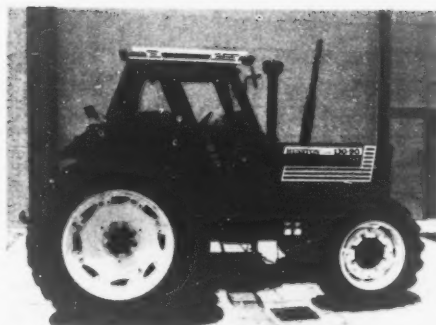
*Implement load capacity for transport purposes not specified by manufacturer.



Hitch Dimensions as Tested — No Load

	inch	mm
A	51.1	791
B	10.1	257
C	16.9	430
D	16.1	409
E	9.0	229
F	11.0	280
G	32.8	832
H	2.5	64
I	16.7	425
J	21.8	552
K	21.5	546
L	48.5	1232
M	26.2	665
N	40.0	1016
O	8.0	203
P	40.8	1035
Q	56.3	921
R	34.9	886

NEBRASKA TRACTOR TEST 1533—HESSTON 140-90DT TURBO FIAT DIESEL ALSO HESSTON 140-90 TURBO FIAT DIESEL 16 SPEED



Hesston 130-90DT Turbo Fiat Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Irvin T. Omvedt, Dean and Director

Department of Agricultural Engineering

Dates of Test: August 29-September 7, 1984

Manufacturer: FIAT TRATTORI, S.p.A. Via Picodella Mirandola, 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8377 Fuel weight 6.975 lb/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SE, CC, CD To motor 5.471 gal (13.139 l) Drained from motor 3.252 gal (12.310 l) Transmission and final drive lubricant API 303 hydraulic fluid Total time engine was operated 42.5 hours.

ENGINE: Make FIAT/VECO Diesel Type six cylinder vertical with turbocharger Serial No. 8065.25*000-004695* Crankshaft lengthwise Rated rpm 2500 Bore and stroke 4.094" x 4.527" (104 mm x 115 mm) Compression ratio 16.5 to 1 Displacement 358 cu in (5861 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and centrifugal pre-cleaner Oil filter two full flow cartridges Oil cooler engine coolant heat exchanger for crankcase oil Fuel filter two paper cartridges and sediment bowl Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist with duals Serial No. 160-90DT/13*259142* Tread width rear 60" (1524 mm) to 129" (3277 mm) front 64" (1625 mm) to 92" (2337 mm) Wheel base 105.1" (2670 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 34.6" (880 mm) Vertical distance above roadway 42.5" (1080 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.9 (3.1) second 2.4 (3.8) third 2.9 (4.6) fourth 3.5 (5.7) fifth 3.9 (6.3) sixth 4.3 (6.9) seventh 4.8 (7.7) eighth 5.3 (8.6) ninth 5.8 (9.3) tenth 6.5 (10.4) eleventh 7.2 (11.6) twelfth 7.9 (12.7) thirteenth 9.8 (15.8) fourteenth 12.0 (19.3) fifteenth 14.5 (23.3) sixteenth 18.0 (29.0) reverse 1.5 (2.4), 1.9 (3.0), 2.3 (3.7), 2.8 (4.5), 3.1 (5.0), 3.5 (5.6), 3.9 (6.2), 4.2 (6.8), 4.7 (7.5), 5.2 (8.3), 5.8 (9.3), 6.4 (10.3), 7.9 (12.7), 9.6 (15.5), 11.6 (18.7), 14.4 (23.2) Clutch single dry disc hydraulically operated by foot pedal Brakes multiple wet disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 202" (5.14 m) left 204" (5.18 m) (on

POWER TAKE-OFF PERFORMANCE

Power Hhp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °C			
		gal/hr (l/h)	Bhp/hr (kW h)	Hp-hr/gal (kW h/l)	Cooling medium	Air wet bulb	Air dry bulb	Barometer in./hHg (kPa)

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed—Two hours (PTO Speed—1017 rpm)								
123.35 (90.88)	2500	7.295 (27.610)	0.412 (0.251)	16.91 (1.332)	188	64	75	28.96 (97.80)

Standard Power Take-off Speed (1000 rpm)—One Hour								
122.83 (90.60)	2450	7.175 (27.149)	0.407 (0.248)	17.12 (1.374)	189	63	75	28.95 (97.76)

VARYING POWER AND FUEL CONSUMPTION—Two Hours

108.67 (80.03)	2500	6.834 (25.870)	0.439 (0.267)	15.90 (1.132)	180	61	75	
0.00 (0.00)	2738	2.473 (9.162)			178	61	75	
56.23 (41.93)	2682	4.692 (17.762)	0.582 (0.334)	11.98 (2.361)	181	61	75	
122.89 (90.64)	2501	7.282 (27.564)	0.413 (0.251)	16.88 (1.325)	190	62	76	
28.42 (21.19)	2709	3.566 (13.497)	0.873 (0.532)	7.97 (1.570)	179	62	76	
82.79 (61.73)	2652	5.755 (21.784)	0.493 (0.295)	14.39 (2.874)	188	63	76	
Av 66.50 (49.39)	2645	5.100 (19.306)	0.535 (0.325)	13.04 (2.568)	184	62	75	28.94 (97.71)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbf (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel consumption			Temp °C			
					gal/hr (l/h)	Bhp/hr (kW h)	Hp-hr/gal (kW h/l)	Cool- ing med	Air wet bulb	Air dry bulb	Barom in./hHg (kPa)
Maximum Available Power — Two Hours 8th (III-2) Gear											
104.17 (77.68)	7737 (34.42)	5.05 (8.13)	2500	5.89	7.233 (27.100)	0.484 (0.295)	14.40 (2.837)	180	61	75	29.11 (99.30)
75% of Pull at Maximum Power — Ten Hours 8th (III-2) Gear											
84.02 (62.65)	5889 (26.20)	5.35 (8.61)	2600	4.15	6.384 (24.167)	0.530 (0.322)	13.16 (2.592)	188	61	83	28.61 (98.63)
50% of Pull at Maximum Power — Two Hours 8th (III-2) Gear											
57.74 (43.06)	3926 (17.46)	5.52 (8.88)	2644	2.86	5.190 (19.646)	0.627 (0.381)	11.13 (2.192)	189	61	79	28.54 (98.36)
50% of Pull at Reduced Engine Speed — Two Hours 12th (III-4) Gear											
57.75 (43.05)	3926 (17.46)	5.51 (8.87)	1762	2.78	3.900 (14.762)	0.471 (0.287)	14.80 (2.916)	188	63	84	28.57 (98.66)

MAXIMUM POWER IN SELECTED GEARS

86.51 (64.31)	12687 (58.41)	2.56 (4.12)	2593 (15.6)	14.67 (24.4)	5rd (I-5) Gear	190 (87.3)	60 (15.6)	75 (24.4)	28.52 (96.31)
100.47 (74.80)	11803 (52.50)	3.19 (5.14)	2500 (15.6)	10.81 (17.8)	4th (I-4) Gear	189 (87.3)	54 (13.3)	59 (19.0)	29.16 (98.47)
103.10 (76.88)	10734 (47.74)	3.60 (5.80)	2500 (15.6)	9.06 (14.7)	5th (II-1) Gear	189 (87.2)	55 (12.8)	60 (19.6)	29.16 (98.47)
104.53 (77.94)	9674 (43.03)	4.05 (6.52)	2499 (15.6)	7.54 (12.2)	6th (III-1) Gear	189 (87.2)	56 (13.3)	63 (17.2)	29.16 (98.47)
105.24 (78.48)	8702 (38.98)	4.50 (7.23)	2499 (15.6)	6.65 (10.7)	7th (II-2) Gear	189 (87.2)	56 (13.3)	64 (17.8)	29.16 (98.47)
105.81 (78.90)	7852 (34.93)	5.05 (8.13)	2500 (15.6)	5.81 (9.4)	8th (III-2) Gear	190 (87.8)	59 (15.0)	70 (21.1)	29.14 (98.40)
104.90 (78.23)	7086 (31.32)	5.55 (8.93)	2501 (15.6)	5.12 (8.3)	9th (II-3) Gear	190 (87.8)	58 (14.4)	68 (20.0)	29.14 (98.40)
104.92 (78.24)	6348 (28.24)	6.20 (9.97)	2501 (15.6)	4.50 (7.2)	10th (III-1) Gear	190 (87.8)	57 (13.9)	65 (18.3)	29.15 (98.44)
103.85 (77.44)	5596 (24.89)	6.96 (11.20)	2501 (15.6)	3.94 (6.3)	11th (II-4) Gear	189 (87.2)	57 (13.9)	65 (18.3)	29.15 (98.44)
102.51 (76.29)	4947 (22.00)	7.76 (12.48)	2500 (15.6)	3.47 (5.6)	12th (III-4) Gear	189 (87.2)	58 (14.4)	66 (18.9)	29.15 (98.44)
101.73 (75.86)	3954 (17.59)	9.65 (15.53)	2501 (15.6)	2.82 (4.5)	13th (IV-1) Gear	190 (87.5)	58 (14.4)	67 (19.4)	29.14 (98.40)

LUGGING ABILITY IN 8th (III-2) GEAR

Crankshaft Speed rpm	2500	2254	1998	1755	1495	1246
Pull—lb (kN)	7852 (34.93)	8361 (37.19)	9333 (41.52)	10179 (45.28)	10388 (46.21)	9672 (43.02)
Increase in Pull %	0	6	19	50	52	23
Power—Hp (kW)	105.81 (78.90)	105.81 (78.31)	101.00 (73.77)	98.93 (69.92)	93.76 (68.53)	81.20 (59.41)
Speed—Mph (km/h)	5.05 (8.13)	4.55 (7.29)	3.97 (6.40)	3.45 (5.56)	2.95 (4.72)	2.47 (3.97)
Slip %	5.81	6.35	7.39	8.41	8.70	7.85

TRACTOR SOUND LEVEL WITH CAB		Front Wheel Drive Engaged dB(A) Disengaged dB(A)	
Maximum Available Power—Two Hours		78.5	78.0
75% of Pull at Maximum Power—Ten Hours			78.5
50% of Pull at Maximum Power—Two Hours			79.5
50% of Pull at Reduced Engine Speed—Two Hours			77.0
Bystander in 16th (IV-4) gear			80.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Temp. °F (°C)	Barom. inches Hg (kPa)
						Cond. wet bulb	Air dry
Maximum Available Power - Two Hours 8th (III-2) Gear							
105.52 (78.48)	7682 (34.17)	5.15 (8.29)	2500 (15.6)	4.43 (7.2)	7.226 (27.333)	0.478 (0.291)	14.60 (2.877)
							190 61 74 29.06 (87.8) (15.8) (23.3) (98.11)
MAXIMUM POWER IN SELECTED GEARS							
87.82 (65.49)	15559 (69.21)	2.12 (3.41)	2589 (15.6)	14.78 (24.4)	2nd (I-2) Gear	189 (86.9)	58 75 28.52 (14.4) (23.9) (96.31)
106.65 (79.33)	8676 (38.59)	4.61 (7.42)	2499 (15.6)	5.06 (8.1)	7th (II-2) Gear	189 (87.2)	57 64 29.15 (13.9) (17.8) (98.44)
107.15 (79.90)	7800 (34.70)	5.15 (8.29)	2500 (15.6)	4.51 (7.2)	8th (III-2) Gear	189 (87.2)	59 69 29.14 (15.0) (20.6) (98.40)

concrete surface without brake) right 241" (6.12 m) left 241" (6.12 m) Turning space diameter (on concrete surface with brake applied) right 419" (10.63 m) left 423" (10.73 m) (on concrete surface without brake) right 497" (12.63 m) left 497" (12.63 m) Power take-off 540 rpm at 2261 engine rpm and 1000 rpm at 2459 engine rpm Unladen tractor mass 14565 lbs (6607 kg).

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 140°F (60°C). Eleven gears were chosen between 15% slip and 10 mph (16.1 km/h). During final inspection, longitudinal scratches were found on cylinders number one and three.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1533, December 10, 1984.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

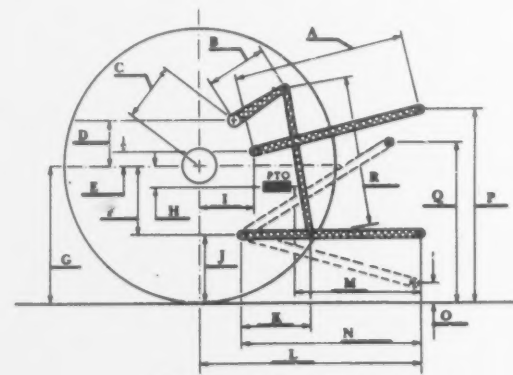
Board of Tractor Test Engineers

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Size	Four 18.4-38; 8, 14 (93)	Four 18.4-38; 8, 14 (93)	Four 18.4-38; 8, 14 (93)
Ballast	—No. max. ply & psi (kPa) —Liquid (each) —Tire Equip (each)	None None 72 lb (33 kg)	None None None
Front Tires	—No. max. ply & psi (kPa) —Liquid (each) —Tire Equip (each)	Two 14.9-28; 6, 30 (140) None 43 lb (19 kg)	Two 14.9-28; 6, 30 (140) None None
Height of Drawbar		21.5 in (545 mm)	21.5 in (545 mm)
Static Weight with Operator—Rear		11050 lb (5012 kg)	10760 lb (4880 kg)
	—Front —Total	5375 lb (2438 kg) 16425 lb (7450 kg)	5390 lb (2400 kg) 16650 lb (7280 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2400	16350
Location	remote	
Hydraulic oil temperature °F (°C)	199	93
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	no	
	II	*not measured
LOAD lb (kg)	7042	3194
TIME sec	2.06	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.0	105
Top of timed range	36.0	911
Highest position	36.5	927
LOAD CG MOVEMENT in (mm)		
Lowest position	11.8	298
Top of timed range	34.5	873
Highest position	35.1	891

*Implement load capacity for transport purposes not specified by manufacturer.



Hitch Dimensions as Tested — No Load

	inch	mm
A	32.0	813
B	10.8	275
C	16.9	430
D	16.1	409
E	9.0	229
F	11.0	279
G	32.5	819
H	2.5	64
I	16.7	423
J	21.3	540
K	21.5	546
L	48.5	1232
M	26.2	665
N	40.0	1016
O	8.0	203
P	40.3	1022
Q	36.8	933
R	34.4	873



Hesston 140-90DT Turbo Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1534—HESSTON 160-90DT TURBO FIAT DIESEL ALSO HESSTON 160-90 TURBO FIAT DIESEL 16 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hhp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature (°C)				Barometer mb Hg (kPa)
		gal/hr (l/h)	Bhp/hr (kW/h)	Hhp/hr gal (kW/h/l)	Cooling medium	Air wet bulb	Air dry bulb	

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed—Two hours (PTO Speed—1061 rpm)

141.71 (105.68)	2200	8.576 (31.703)	0.412 (0.251)	16.92 (1.111)	180 (82.1)	70 (20.9)	75 (24.1)	29.42 (99.13)
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Standard Power Take-off Speed (1000 rpm)—One hour

145.91 (107.32)	2074	8.210 (31.078)	0.598 (0.242)	17.55 (1.431)	181 (82.9)	70 (20.9)	75 (23.7)	29.41 (99.11)
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VARYING POWER AND FUEL CONSUMPTION—Two Hours

124.36 (92.74)	2272	7.589 (28.728)	0.426 (0.259)	16.39 (1.228)	176 (79.7)	71 (21.7)	76 (24.2)	
0.00 (0.00)	2425	2.560 (9.690)			175 (79.2)	71 (21.7)	75 (23.6)	
64.68 (48.23)	2364	5.029 (19.038)	0.542 (0.330)	12.86 (2.331)	175 (79.4)	71 (21.7)	76 (24.2)	
143.04 (106.67)	2200	8.420 (31.871)	0.410 (0.250)	16.99 (1.147)	179 (81.7)	71 (21.7)	76 (24.4)	
32.71 (24.39)	2391	5.838 (14.527)	0.818 (0.496)	8.32 (1.679)	175 (79.2)	71 (21.7)	75 (23.9)	
95.26 (71.04)	2323	6.365 (24.089)	0.466 (0.283)	14.97 (2.969)	177 (80.1)	71 (21.7)	76 (24.4)	
Av 78.68 (57.18)	2329	5.655 (21.321)	0.512 (0.312)	13.61 (2.681)	178 (79.9)	71 (21.7)	75 (24.1)	29.36 (99.18)

DRAWBAR PERFORMANCE

(Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbf (kN)	Speed mph (km/h)	Crank shaft speed rpm	Mip °	Fuel Consumption			Temp (°C)			Barom. mm Hg (kPa)
					gal/hr (l/h)	Bhp/hr (kW/h)	Hhp/hr (kW/h)	Cool. med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 8th (III-2) Gear											
129.63 (89.21)	8435 (37.51)	5.32 (8.56)	2201	5.94	8.518 (31.486)	0.485 (0.295)	14.58 (2.833)	179 (81.7)	57 (13.6)	74 (23.1)	28.98 (97.86)
75% of Pull at Maximum Power—Ten Hours 8th (III-3) Gear											
97.22 (72.50)	6461 (28.74)	5.64 (9.08)	2291	4.26	7.138 (27.018)	0.512 (0.311)	13.62 (2.683)	178 (81.3)	62 (16.4)	69 (20.7)	28.87 (97.50)
50% of Pull at Maximum Power—Two Hours 8th (III-2) Gear											
67.24 (50.14)	4507 (19.16)	5.85 (9.42)	2342	2.94	5.679 (21.498)	0.589 (0.358)	11.84 (2.332)	178 (81.1)	58 (14.4)	80 (26.2)	28.95 (97.74)
50% of Pull at Reduced Engine Speed—Two Hours 12th (III-4) Gear											
67.22 (50.12)	4506 (19.15)	5.85 (9.42)	1562	2.77	4.605 (17.426)	0.478 (0.290)	14.60 (2.876)	177 (80.6)	58 (14.4)	80 (26.2)	28.93 (97.69)

MAXIMUM POWER IN SELECTED GEARS

99.17 (73.95)	15848 (61.60)	2.69 (4.32)	2276	14.90			3rd (I-3) Gear	179 (81.7)	59 (15.0)	62 (18.3)	28.82 (97.32)
116.11 (86.59)	12961 (57.65)	5.36 (8.61)	2199	10.95			4th (I-4) Gear	178 (81.1)	46 (7.8)	48 (8.9)	28.97 (97.83)
119.61 (89.19)	11821 (52.58)	5.79 (9.11)	2200	9.13			5th (II-1) Gear	178 (81.1)	47 (8.3)	50 (10.0)	28.98 (97.86)
120.51 (89.86)	10579 (47.06)	4.27 (6.87)	2200	7.77			6th (II-1) Gear	178 (81.1)	49 (9.4)	53 (11.7)	28.98 (97.86)
121.31 (90.46)	9584 (42.63)	4.75 (7.64)	2199	6.77			7th (II-2) Gear	178 (81.1)	49 (9.4)	54 (12.2)	28.98 (97.86)
122.23 (91.15)	8614 (38.51)	5.32 (8.56)	2198	5.90			8th (III-2) Gear	179 (81.7)	54 (12.2)	66 (18.9)	29.00 (97.91)
121.39 (90.32)	7794 (34.62)	5.84 (9.40)	2200	5.54			9th (II-3) Gear	178 (81.1)	50 (10.0)	56 (13.3)	28.99 (97.89)
121.09 (89.56)	6953 (27.34)	6.55 (11.79)	2201	4.60			10th (III-3) Gear	178 (81.1)	51 (10.6)	58 (14.4)	28.99 (97.89)
120.10 (88.74)	6147 (24.29)	7.35 (13.13)	2198	4.03			11th (II-4) Gear	178 (81.1)	52 (11.3)	60 (16.7)	28.99 (97.91)
119.00	5460	8.17	2199	3.53			12th (III-4) Gear	178	53	62	29.00

Department of Agricultural Engineering

Dates of Test: September 25 to October 8, 1984

Manufacturer: FIAT TRATTORI S.p.A. Via Piccollella Mirandola, 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8375 Fuel weight 6.973 lbs/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 3.866 gal (14.635 l) Drained from motor 3.422 gal (12.953 l) Transmission and final drive lubricant API 303 hydraulic fluid Total time engine was operated 43.5 hours.

ENGINE: Make Fiat/IVECO Diesel Type six cylinder vertical with turbocharger Serial No. 8365 25*503*755274* Crankshaft lengthwise Raised rpm 2200 Bore and stroke 4.528" x 5.118" (115 mm x 130 mm) Compression ratio 15.5 to 1 Displacement 494 cu in (8102 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and centrifugal pre-cleaner Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, engine coolant heat exchanger for transmission oil Fuel filter one paper cartridge, one paper element and sediment bowl Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist with duals Serial No. 160-90DT 15*261183* Tread width rear 60" (1524 mm) to 129" (3277 mm) front 64" (1625 mm) to 92" (2337 mm) Wheel base 113.8" (2890 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 37.2" (945 mm) Vertical distance above roadway 42.5" (1080 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 2.1 (3.3) second 2.5 (4.0) third 3.0 (4.9) fourth 3.8 (6.1) fifth 4.2 (6.7) sixth 4.6 (7.4) seventh 5.1 (8.2) eighth 5.6 (9.1) ninth 6.1 (9.9) tenth 6.8 (11.0) eleventh 7.6 (12.3) twelfth 8.4 (13.6) thirteenth 10.4 (16.8) fourteenth 12.7 (20.5) fifteenth 15.4 (24.8) sixteenth 19.1 (30.7) reverse 1.6 (2.6), 2.0 (3.2), 2.4 (3.9), 3.0 (4.8), 3.4 (5.5), 3.7 (5.9), 4.0 (6.5), 4.5 (7.3), 4.9 (7.9), 5.5 (8.8), 6.1 (9.8), 6.8 (10.9), 8.1 (13.1), 10.2 (16.4), 12.3 (19.8), 15.3 (24.6) Clutch double dry disc hydraulically operated by foot pedal Brakes multiple wet disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 225" (5.72 m) left 225" (5.72 m) (on

LUGGING ABILITY IN 8th (III-2) GEAR

Crankshaft Speed rpm	2108	1983	1757	1545	1314	1092
Pull—lbs (kN)	8614 (38.1)	9587 (41.76)	9581 (42.62)	9729 (43.28)	9515 (42.32)	8851 (39.39)
Increase in Pull %	0	9	11	15	10	0
Power—Hp (kW)	122.23 (89.15)	119.25 (88.92)	107.61 (80.25)	95.87 (71.49)	79.95 (59.62)	60.72 (45.28)
Speed—Mph (km/h)	5.92 (8.56)	4.76 (7.67)	4.21 (6.78)	3.70 (5.95)	3.15 (5.07)	2.64 (4.25)
Slip %	5.90	6.61	6.77	6.92	6.77	6.14

TRACTOR SOUND LEVEL WITH CAB

	Front Wheel Drive Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours	79.0	78.0
75% of Pull at Maximum Power—Ten Hours		78.5
50% of Pull at Maximum Power—Two Hours		78.0
50% of Pull at Reduced Engine Speed—Two Hours		75.5
Bystander in 16th (IV-4) gear		85.5

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Slip %	Fuel Consumption gal/hr (liters/hr)	Temp. °F (°C)	Air psi (kPa)	Barom. inches Hg (kPa)
Maximum Available Power - Two Hours 8th (III-2) Gear							
120.08 (89.56)	8284 (36.85)	5.44 (8.75)	2200 (5.25)	4.92 (7.42)	8.505 (0.291)	14.46 (2.849)	179 (81.7)
MAXIMUM POWER IN SELECTED GEARS							
100.22 (74.74)	16644 (74.03)	2.26 (3.63)	2281 (5.63)	14.49 (3.63)	2nd (I-2) Gear	179 (81.6)	59 (15.0)
122.41 (91.78)	8456 (37.52)	5.44 (8.76)	2199 (5.44)	4.72 (11.7)	8th (III-2) Gear	179 (81.7)	55 (17.8)

TIRES, BALLAST AND WEIGHT

Base Tires	With Ballast	Without Ballast
—No. Size ply & psi (kPa)	Four 20.5-38, 8, 14 (95)	Four 20.5-38, 8, 14 (95)
Ballast	—Liquid (each)	None
—Cast Iron (each inner)	490 lbs (222 kg)	None
Front Tires	Two 16.9-28, 6, 13 (225)	Two 16.9-28, 6, 13 (225)
Ballast	—No. Size ply & psi (kPa)	None
—Liquid (each)	None	None
—Cast Iron (each)	48 lbs (22 kg)	None
Weight of Drawbar	25.5 in (595 mm)	25.5 in (595 mm)
Static Weight with Operator—Rear	12055 lb (5740 kg)	11875 lb (5790 kg)
—Front	5715 lb (2592 kg)	5080 lb (2549 kg)
—Total	18570 lb (8332 kg)	17295 lb (7845 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure (psi) (kPa)	2425	16720
Location	remote	
Hydraulic oil temperature °F (°C)	190	88
Location	pump inlet	
Maximum Lift Capacity		Lift Capacity for Transport
QUICK ATTACH CATEGORY	10	*not measured
LOAD lbs (kg)	**12516	5677
TIME sec	5.21	
HITCH POINT MOVEMENT in (mm)		
Lowest position	11.1	283
Top of timed range	55.1	892
Highest position	56.1	918
LOAD CG MOVEMENT in (mm)		
Lowest position	12.0	105
Top of timed range	54.5	876
Highest position	55.6	903

*Implement load capacity for transport purposes not specified by manufacturer.
**Manufacturers advertised capacity was 13450 lbs (6100 kg).

concrete surface without brake) right 265" (6.72 m) left 265" (6.72 m). Turning space diameter (on concrete surface with brake applied) right 467" (11.87 m) left 467" (11.87 m) (on concrete surface without brake) right 546" (13.87 m) left 546" (13.87 m). Power take-off 540 rpm at 1950 engine rpm and 1000 rpm at 2074 engine rpm. Unladen tractor mass 15520 lb (7040 kg).

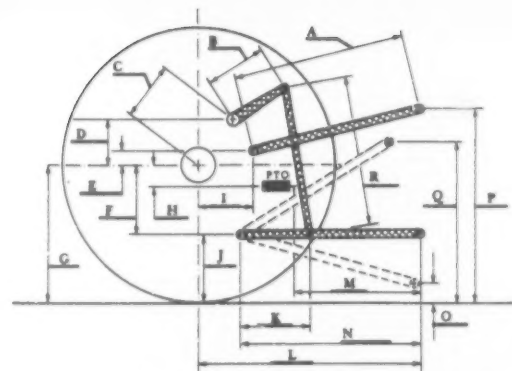
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 153°F (56.0°C). Ten gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1554, December 10, 1984.

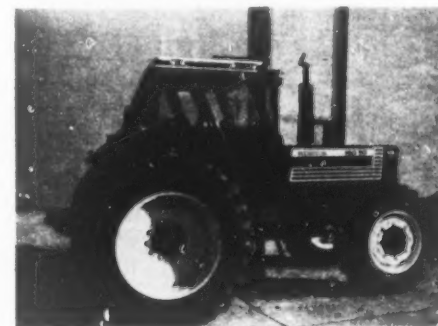
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
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Board of Tractor Test Engineers



Hitch Dimensions as Tested—No Load

	inch	mm
A	31.5	800
B	10.8	275
C	16.9	430
D	16.1	409
E	9.0	229
F	11.0	280
G	54.0	864
H	2.5	64
I	16.7	425
J	25.0	594
K	21.5	546
L	48.5	1232
M	26.2	665
N	40.0	1016
O	8.0	203
P	42.0	1067
Q	56.8	933
R	55.5	902



Heaton 160-90DT Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1535—HESSTON 180-90 DT TURBO FIAT DIESEL ALSO HESSTON 180-90 TURBO FIAT DIESEL 16 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)				Barometer inch Hg (kPa)
		gal/hr (l/hr)	Bhp/hr (kg/kW hr)	Hip/hr gal (kW/kg)	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed—1061 rpm)								
162.87 (121.45)	2200	9.588 (35.516)	0.402 (0.244)	17.35 (17.418)	177 (80.0)	67 (19.3)	75 (24.0)	29.54 (99.06)
Standard Power Take-off Speed (1000 rpm) — One Hour								
158.66 (118.51)	2075	8.881 (33.614)	0.553 (0.237)	17.86 (17.920)	178 (80.8)	67 (19.3)	75 (24.0)	29.51 (98.98)
VARYING POWER AND FUEL CONSUMPTION — Two Hours								
145.17 (106.76)	2275	8.501 (32.126)	0.414 (0.252)	16.84 (17.118)	175 (79.2)	66 (18.9)	74 (21.3)	
0.00 (0.00)	2440	2.729 (10.529)			175 (79.2)	66 (18.9)	76 (24.2)	
74.53 (55.58)	2570	5.604 (21.213)	0.524 (0.319)	15.50 (2.620)	175 (79.4)	65 (18.5)	74 (21.3)	
164.00 (122.30)	2201	9.450 (35.697)	0.401 (0.244)	17.59 (17.426)	177 (80.3)	67 (19.2)	75 (23.6)	
57.76 (42.16)	2400	4.115 (15.776)	0.760 (0.662)	9.18 (1.808)	175 (79.4)	66 (18.9)	75 (23.6)	
109.50 (81.95)	2528	7.095 (26.850)	0.450 (0.274)	15.49 (17.052)	176 (79.2)	67 (19.2)	76 (24.2)	
Av (65.79)	88.23 2555	6.245 (23.441)	0.495 (0.340)	14.15 (2.783)	175 (79.5)	66 (18.9)	75 (23.8)	29.28 (98.88)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption		Temp °F (°C)				Barom. inches Hg (kPa)
					gal/hr (l/hr)	Bhp/hr (kg/kW hr)	Cool- ing med	Air wet bulb	Air dry bulb		
Maximum Available Power — Two Hours 8th (III-2) Gear											
157.22 (102.32)	9916 (44.11)	5.19 (8.15)	2200	7.34	9.261 (35.057)	0.470 (0.286)	14.82 (2.919)	17 (80.6)	44 (6.4)	56 (13.3)	29.28 (98.87)
75% of Pull at Maximum Power — Ten Hours 8th (III-2) Gear											
112.14 (81.62)	7568 (33.66)	5.56 (8.94)	2296	4.98	7.869 (29.289)	0.495 (0.298)	14.25 (2.807)	177 (80.8)	48 (8.7)	62 (16.4)	29.09 (98.24)
50% of Pull at Maximum Power — Two Hours 8th (III-2) Gear											
71.20 (51.31)	5046 (22.65)	5.81 (9.15)	2361	3.59	6.563 (24.087)	0.567 (0.344)	12.29 (2.421)	177 (80.0)	51 (10.6)	61 (16.1)	28.95 (97.24)
50% of Pull at Reduced Engine Speed — Two Hours 12th (III-4) Gear											
78.21 (58.12)	5046 (22.64)	5.81 (9.35)	1570	3.50	5.086 (19.251)	0.455 (0.276)	15.58 (1.029)	176 (80.0)	56 (13.3)	69 (20.6)	28.95 (97.69)
MAXIMUM POWER IN SELECTED GEARS											
127.48 (95.06)	14713 (65.44)	5.25 (7.23)	2245	14.80			4th (I-4) Gear	178 (81.1)	47 (8.3)	55 (12.8)	28.94 (97.73)
153.55 (99.44)	13850 (61.61)	5.61 (7.81)	2200	12.67			5th (II-1) Gear	177 (80.3)	56 (2.2)	42 (5.6)	29.55 (99.11)
157.07 (102.22)	12455 (55.19)	4.15 (6.64)	2199	10.01			6th (III-1) Gear	177 (80.3)	58 (3.1)	45 (7.2)	29.55 (99.11)
158.59 (105.19)	11241 (50.80)	4.62 (7.43)	2200	8.62			7th (II-2) Gear	177 (80.3)	58 (3.1)	46 (7.8)	29.56 (99.14)
159.90 (104.13)	10091 (44.88)	5.20 (8.17)	2201	7.26			8th (III-2) Gear	177 (80.6)	42 (5.6)	55 (11.7)	29.32 (99.01)
140.09 (104.66)	9187 (40.86)	5.72 (9.20)	2202	6.49			9th (II-3) Gear	176 (80.0)	59 (3.9)	47 (8.3)	29.56 (99.14)
140.45 (104.27)	8225 (36.58)	6.40 (10.31)	2201	5.54			10th (III-3) Gear	177 (80.6)	59 (3.9)	48 (8.9)	29.55 (99.11)
159.17 (115.34)	7245 (32.23)	7.20 (11.39)	2201	4.90			11th (II-4) Gear	177 (80.6)	40 (4.4)	49 (9.6)	29.54 (99.08)
171.38 (101.34)	6467 (28.27)	8.04 (12.93)	2200	4.25			12th (III-4) Gear	177 (80.6)	40 (4.4)	50 (10.0)	29.53 (99.04)

Department of Agricultural Engineering

Dates of Test: September 25 to October 4, 1984

Manufacturer: FIAT TRATTORI, S.p.A. Via Picciolla Mirandola, 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8371 Fuel weight 6.970 lbs/gal (0.835 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 4.006 gal (15.167 l) Drained from motor 3.310 gal (12.530 l) Transmission and final drive lubricant API 505 hydraulic fluid Total time engine was operated 41.0 hours.

ENGINE: Make Fiat/IVECO Diesel Type six cylinder vertical with turbocharger Serial No. 8365 25502*755356* Crankshaft lengthwise Rated rpm 2200 Bore and stroke 4.528" x 5.118" (115 mm x 130 mm) Compression ratio 15.5 to 1 Displacement 494 cu in (8102 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and centrifugal pre-cleaner Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, engine coolant heat exchanger for transmission oil Fuel filter one paper cartridge, one paper element and sediment bowl Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist with duals Serial No. 180-90DT-15*263130* Tread width rear 60" (1524 mm) to 129" (3277 mm) front 64" (1625 mm) to 92" (2337 mm) Wheel base 115.8" (2890 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 37.2" (946 mm) Vertical distance above roadway 42.5" (1080 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 2.1 (3.3) second 2.5 (4.0) third 3.0 (4.9) fourth 3.8 (6.1) fifth 4.2 (6.7) sixth 4.6 (7.4) seventh 5.1 (8.2) eighth 5.6 (9.1) ninth 6.1 (9.9) tenth 6.8 (11.0) eleventh 7.6 (12.3) twelfth 8.4 (13.6) thirteenth 10.4 (16.8) fourteenth 12.7 (20.5) fifteenth 15.4 (24.8) sixteenth 19.1 (30.7) reverse 1.6 (2.6), 2.0 (3.2), 2.4 (3.9), 3.0 (4.8), 3.4 (5.5), 3.7 (5.9), 4.0 (6.5), 4.5 (7.3), 4.9 (7.9), 5.5 (8.8), 5.1 (8.9), 6.8 (10.9), 8.1 (13.1), 10.2 (16.4), 12.5 (19.8), 15.3 (24.6) Clutch double dry disc hydraulically operated by foot pedal Brakes multiple wet disc hydraulically operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake

LUGGING ABILITY IN 8th (III-2) GEAR

Crankshaft Speed rpm	2201	1981	1760	1540	1315	1084
Pull—lb (kN)	10091	10639	11058	12340	12232	9748
	(44.88)	(47.32)	(49.19)	(54.89)	(54.41)	(43.36)
Increase in Pull %	0	5	10	22	21	-5
Power—Hp (kW)	159.90	151.87	121.19	116.58	98.57	66.66
	(104.13)	(98.34)	(90.37)	(86.93)	(73.51)	(49.20)
Speed—Mph (km/h)	5.20	4.65	4.11	3.54	3.02	2.56
	(8.37)	(7.48)	(6.61)	(5.70)	(4.86)	(4.13)
Slip %	7.26	7.87	8.17	9.80	9.80	7.26

TRACTOR SOUND LEVEL WITH CAB		Front Wheel Drive Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours		78.5	78.5
75% of Pull at Maximum Power—Ten Hours		78.5	78.5
50% of Pull at Maximum Power—Two Hours		78.5	78.5
50% of Pull at Reduced Engine Speed—Two Hours		75.5	75.5
bystander in 16th (IV-4) gear		86.0	86.0

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Bhp/hr (kg/kWh)	Cool- ing med	Temp. °F (°C) Air wet bulb Air dry bulb Barom. inches Hg (kPa)			
Maximum Available Power — Two Hours 8th (III-2) Gear											
157.82 (102.78)	9697 (43.15)	5.53 (8.58)	2200	5.90	9.252 (34.949)	0.467 (0.284)	14.93 (2.941)	178 (80.8)	45 (7.2)	59 (14.7)	29.25 (98.71)
MAXIMUM POWER IN SELECTED GEARS											
124.54 (92.87)	17507 (77.87)	2.67 (4.29)	2258	14.86	3rd (I-3) Gear			178 (80.8)	45 (7.2)	52 (11.1)	28.94 (97.73)
140.48 (104.78)	9876 (43.91)	5.53 (8.58)	2200	5.98	8th (III-2) Gear			177 (80.6)	41 (5.0)	52 (11.1)	29.53 (99.04)

TIRES, BALLAST AND WEIGHT

Base Tires	Ballast	Four 20.8-58, R 16 (110)		Four 20.8-58, R 16 (110)	
		—No. size, ply & psi (kPa)	—Lugad (each inner)	—No. size, ply & psi (kPa)	—Lugad (each inner)
Front Tires	Ballast	Two 16.9-28, 6, 18 (125)	None	Two 16.9-28, 6, 18 (125)	None
		—No. size, ply & psi (kPa)	—Lugad (each)	—No. size, ply & psi (kPa)	—Lugad (each)
		—Cast iron (each)	65 lb (29 kg)	65 lb (29 kg)	65 lb (29 kg)
Height of Drawbar		22.5 in (570 mm)		22.5 in (570 mm)	
Static Weight with Operator—Rear		19975 lb (8979 kg)		19975 lb (8979 kg)	
—Front		5750 lb (2608 kg)		5750 lb (2608 kg)	
—Total		19725 lb (8947 kg)		19725 lb (8947 kg)	

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)		2400	16550
Location		remote	
Hydraulic oil temperature °F (°C)		190	88
Location		pump inlet	
		Maximum Lift Capacity	
QUICK ATTACH CATEGORY		no	
		II	
LOAD lb (kg)		**12254	5549
TIME, sec		5.34	
		Lift Capacity for Transport	
HITCH POINT MOVEMENT in (mm)			
Lowest position		10.1	257
Top of timed range		54.1	867
Highest position		56.0	914
		LOAD CG MOVEMENT in (mm)	
Lowest position		10.8	273
Top of timed range		53.5	846
Highest position		55.4	900

*Implement load capacity for transport purposes not specified by manufacturer.
**Manufacturers advertised capacity was 13450 lb (6100 kg).

applied) right 225" (5.72 m) left 225" (5.72 m) (on concrete surface without brake) right 265" (6.72 m) left 265" (6.72 m) Turning space diameter (on concrete surface with brake applied) right 467" (11.87 m) left 467" (11.87 m) (on concrete surface without brake) right 546" (13.87 m) left 546" (13.87 m) Power take-off 1000 rpm at 2075 engine rpm Unladen tractor mass 15520 lb (7040 kg).

REPAIRS AND ADJUSTMENTS: During the hydraulic lift test, an "O" ring in the hydraulic pump failed. The hydraulic pump and filter were replaced and test continued.

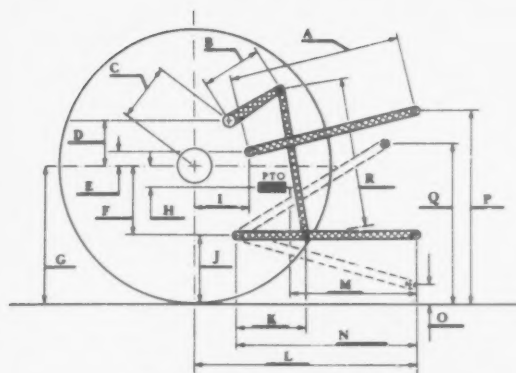
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 134° (56.6°C). Nine gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1535, December 10, 1984.

LOUIS I. LEVITICUS
Engineer-in-Charge

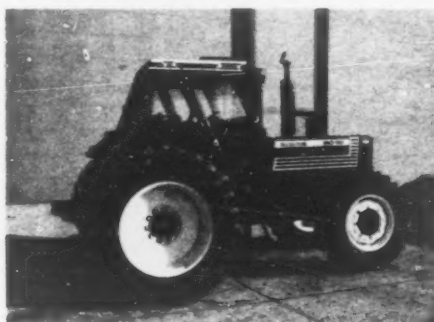
R. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	31.4	797
B	10.8	275
C	16.9	430
D	16.1	409
E	9.0	229
F	11.0	280
G	33.0	839
H	2.5	64
I	16.7	425
J	22.0	559
K	21.5	546
L	48.5	1232
M	26.2	665
N	40.0	1016
O	8.0	203
P	41.0	1041
Q	36.6	930
R	34.9	886



Hesston 180-90DT Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1581 HESSTON 180-90 TURBO POWERSHIFT FIAT DIESEL 16 SPEED

Department of Agricultural Engineering

Dates of Test: October 2 to 16, 1985

Manufacturer: FIAT TRATTORI S.p.A. Via Picodella Mirandola 72- 41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8420 Fuel weight 7.011 lbs/gal (0.840 kg/l) Oil SAE 15W40 API service classification SF-CD To motor 4.038 gal (15.285 l) Drained from motor 3.492 gal (13.219 l) Transmission lubricant Type A automatic transmission fluid Hydraulic and front axle lubricant Hesston M&PS 705106/16 fluid Total time engine was operated 42.5 hours.

ENGINE: Make Fiat/IVECO Diesel Type six cylinder vertical with turbocharger Serial No. 8365 25 504757733* Crankshaft lengthwise Rated rpm 2200 Bore and stroke 4.528" x 5.118" (115 mm x 130 mm) Compression ratio 15.5 to 1 Displacement 494 cu in (8102 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and centrifugal pre-cleaner Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, engine coolant heat exchanger for transmission oil Fuel filter one paper cartridge, one paper element and sediment bowl Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist with dual Serial No. 180-90PSDT/1*263870* Tread width rear 64" (1625 mm) to 125" (3125 mm) front 64" (1625 mm) to 92" (2337 mm) Wheel base 113.8" (2890 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 37.2" (946 mm) Vertical distance above roadway 42.5" (1080 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (4) range operator controlled powershift Advertised speeds mph (km/h) first 2.0 (3.3) second 2.5 (4.0) third 3.0 (4.9) fourth 3.8 (6.1) fifth 4.2 (6.7) sixth 4.6 (7.4) seventh 5.1 (8.2) eighth 5.6 (9.1) ninth 6.1 (9.9) tenth 6.8 (11.0) eleventh 7.6 (12.3) twelfth 8.4 (13.6) thirteenth 10.4 (16.8) fourteenth 12.7 (20.3) fifteenth 15.4 (24.8) sixteenth 19.1 (30.7) reverse 1.6 (2.6), 2.0 (3.2), 2.4 (3.9), 3.0 (4.8), 3.3 (5.4), 3.7 (5.9), 4.0 (6.5), 4.5 (7.3), 4.9 (7.9), 5.5 (8.8), 6.1 (9.8), 6.8 (10.9), 8.1 (13.1), 10.2 (16.4), 12.3 (19.8), 15.3 (24.6) Clutch dual dry disc hydraulically power actuated and operated by foot pedal Brakes multiple wet disc hydraulically operated by two foot pedals which can be locked together Steering hy-

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/h)	Bhp/hr (kg/kWh)	Temp. °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inHg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed — 1061 rpm)							
162.15 (120.91)	2200 (120.91)	10.060 (38.081)	0.455 (0.265)	16.12 (3.175)	178 (81.3)	66 (18.8)	74 (21.6)

Standard Power Take-off Speed (1000 rpm) — One Hour							
161.07 (120.11)	2075 (120.11)	9.605 (36.351)	0.418 (0.234)	16.77 (3.104)	179 (81.6)	70 (20.8)	75 (24.1)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

141.17 (105.27)	2255 (120.91)	8.917 (33.756)	0.445 (0.249)	15.85 (3.119)	177 (80.3)	71 (21.4)	76 (24.4)
0.00 (0.00)	2409 (121.64)	5.214 (19.499)	— (0.345)	— (2.438)	175 (79.4)	69 (20.6)	74 (21.6)
75.55 (54.85)	2549 (122.84)	5.944 (22.099)	0.567 (0.345)	12.38 (2.438)	175 (79.4)	70 (21.4)	75 (24.4)
104.75 (77.46)	2201 (122.84)	10.045 (38.016)	0.427 (0.260)	16.40 (3.211)	179 (81.4)	71 (21.7)	75 (23.9)
57.26 (42.78)	2382 (121.64)	4.626 (17.510)	0.870 (0.529)	8.06 (1.587)	175 (78.3)	68 (19.7)	72 (22.2)
108.59 (80.42)	2507 (120.82)	7.420 (28.087)	0.480 (0.292)	14.61 (2.878)	176 (80.0)	69 (20.3)	73 (22.1)
Ar (85.24)	87.52 (25.339)	2517 (0.336)	6.694 (0.336)	15.07 (2.576)	178 (79.4)	69 (20.8)	74 (23.3)

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (N)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (L/h)	Bhp/hr (kg/kWh)	Temp. °F (°C) Cool- ing med.	Air wet bulb	Air dry bulb	Barom. inHg (kPa)
Maximum Available Power — Two Hours 9th (III-2) Gear										
158.56 (101.31)	9608 (42.74)	5.41 (8.70)	2200 (120.91)	2.56 (0.70)	9.877 (37.580)	0.500 (0.304)	14.88 (2.763)	181 (82.8)	54 (11.9)	28.95 (97.74)
75% of Pull at Maximum Power — Ten Hours 8th (III-2) Gear										
111.65 (83.25)	7425 (33.08)	5.84 (9.07)	2281 (120.91)	1.99 (0.55)	8.595 (31.780)	0.557 (0.321)	13.38 (2.609)	180 (82.0)	49 (9.2)	28.97 (97.81)
50% of Pull at Maximum Power — Two Hours 8th (III-2) Gear										
76.64 (57.15)	4950 (22.02)	5.81 (9.33)	2335 (120.91)	1.42 (0.38)	6.932 (26.240)	0.634 (0.386)	11.06 (2.178)	179 (81.3)	47 (8.1)	28.95 (97.69)
50% of Pull at Reduced Engine Speed — Two Hours 12th (III-4) Gear										
76.58 (57.10)	4950 (22.02)	5.80 (9.34)	1585 (120.91)	1.33 (0.34)	5.491 (20.387)	0.505 (0.306)	15.95 (2.747)	178 (80.8)	49 (9.2)	28.85 (97.41)

MAXIMUM POWER IN SELECTED GEARS

119.02	19734	2.26	2251	10.46	2nd (I-2) Gear	179	45	45	29.07
(180.76)	(87.78)	(1.64)				(81.7)	(6.1)	(7.2)	(98.17)
157.01	18587	2.79	2201	6.72	3rd (I-3) Gear	180	45	48	29.08
(102.17)	(81.29)	(4.50)				(82.2)	(7.2)	(8.9)	(98.20)
140.68	15147	3.48	2198	4.18	4th (I-4) Gear	180	41	45	28.95
(106.91)	(67.18)	(5.61)				(81.9)	(5.0)	(7.2)	(97.69)
142.47	13441	3.97	2201	3.59	5th (II-1) Gear	180	45	48	28.95
(108.24)	(59.79)	(6.40)				(82.2)	(6.1)	(8.9)	(97.69)
145.02	12118	4.45	2200	3.25	6th (III-1) Gear	180	44	50	28.95
(108.65)	(51.90)	(7.12)				(82.2)	(6.7)	(10.0)	(97.69)
142.85	11022	4.86	2200	2.82	7th (II-2) Gear	180	44	51	28.95
(108.32)	(49.03)	(7.82)				(82.2)	(6.7)	(10.6)	(97.69)
141.70	9834	5.40	2201	2.65	8th (III-2) Gear	180	46	50	29.08
(105.67)	(41.74)	(8.70)				(82.2)	(7.8)	(10.0)	(98.20)
159.09	8806	5.92	2200	2.39	9th (II-3) Gear	181	48	58	28.92
(103.72)	(39.17)	(9.51)				(82.5)	(8.9)	(14.6)	(97.66)
158.17	7865	6.59	2200	1.95	10th (III-3) Gear	180	47	56	28.92
(103.04)	(34.99)	(10.60)				(82.2)	(8.1)	(13.1)	(97.66)
157.15	7118	7.25	2201	1.77	11th (II-4) Gear	180	46	55	28.95
(102.27)	(31.66)	(11.85)				(82.2)	(7.8)	(12.8)	(97.69)
155.24	6516	8.05	2200	1.69	12th (III-4) Gear	180	45	55	28.95
(100.85)	(28.08)	(12.92)				(82.2)	(7.2)	(11.7)	(97.69)

LUGGING ABILITY IN 8th (III-2) GEAR

Crankshaft Speed rpm	2201	1985	1752	1558	1315	1091
Pull—lbs	9834	10559	10904	11456	11742	10741
(kN)	(43.74)	(46.97)	(48.77)	(50.87)	(52.21)	(47.78)
Increase in Pull %	0	7	11	16	19	9
Power—Hp	141.70	156.95	125.50	114.69	100.40	76.57
(kW)	(105.67)	(115.12)	(91.59)	(85.32)	(74.87)	(57.10)
Speed—Mph	5.40	4.86	4.29	3.76	3.21	2.67
(km/h)	(8.70)	(7.81)	(6.91)	(6.03)	(5.16)	(4.30)
Slip %	2.65	2.74	2.91	3.08	3.08	2.74

	Front Wheel Drive Disengaged dB(A)	Engaged dB(A)
TRACTOR SOUND LEVEL WITH CAB		
Maximum Available Power—Two Hours	80.5	81.0
75% of Pull at Maximum Power—Ten Hours		81.5
50% of Pull at Maximum Power—Two Hours		81.0
50% of Pull at Reduced Engine Speed—Two Hours		79.0
Bystander in 16th (IV-6) gear		89.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Temp °F (°C)	Barom in. Hg (kPa)
					gal/hr (l/hr)	oil (°F)	oil (°F)
Maximum Available Power—Two Hours 8th (III-2) Gear							
157.65	9687	5.35	2200	5.54	9.863	0.502	15.95
(102.63)	(43.09)	(8.57)			(37.336)	(0.306)	(2.749)

MAXIMUM POWER IN SELECTED GEARS

124.60	14920	3.15	2221	14.54	4th (I-4) Gear	179	41	42	29.06
(92.92)	(66.37)	(5.04)				(81.7)	(5.0)	(5.6)	(98.11)
141.65	9958	5.55	2200	5.50	8th (III-2) Gear	180	48	52	29.09
(105.61)	(44.29)	(8.38)				(82.2)	(8.9)	(11.1)	(98.21)

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Base Tires	Four 20.8R38, 8, 16 (110)	Four 20.8R38, 8, 16 (110)
Ballast	—None	—None
—Liquor (each)	None	None
—Test equip (each)	45 lb (20 kg)	None
Front Tires	Two 16.9R28, 10, 16 (110)	Two 16.9R28, 10, 16 (110)
Ballast	—None	—None
—Liquor (each)	657 lb (299 kg)	None
—Cast Iron (each)	150 lb (68 kg)	None
Height of Drawbar	18.5 in (470 mm)	18.5 in (470 mm)
Basic Weight with Operator—Rear	2210 lb (5519 kg)	17040 lb (5441 kg)
—Front	7960 lb (3318 kg)	5785 lb (2624 kg)
—Total	19570 lb (8877 kg)	17825 lb (8089 kg)

drostatic Turning radius (on concrete surface with brake applied) right 196" (4.98 m) left 202" (5.13 m) (on concrete surface without brake) right 265" (6.72 m) left 270" (6.86 m) Turning space diameter (on concrete surface with brake applied) right 412" (10.46 m) left 424" (10.77 m) (on concrete surface without brake) right 550" (13.97 m) left 560" (14.22 m) Power take-off 1000 rpm at 2075 engine rpm Unladen tractor mass 15915 lb (7219 kg).

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 143°F (61.4°C). Eleven gears were chosen between 15% slip and 10 mph (16.1 km/h). The pull in 2nd (I-2) gear was limited to avoid tractor bouncing.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1581, December 3, 1985.

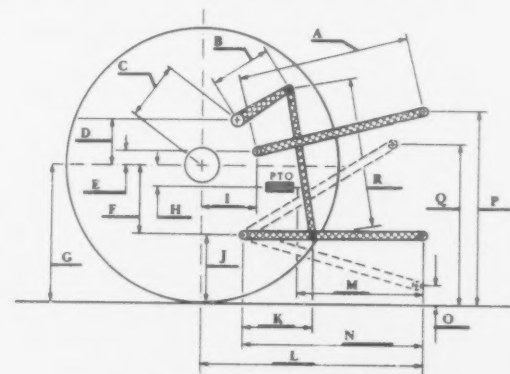
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
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L. L. BASHFORD
Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

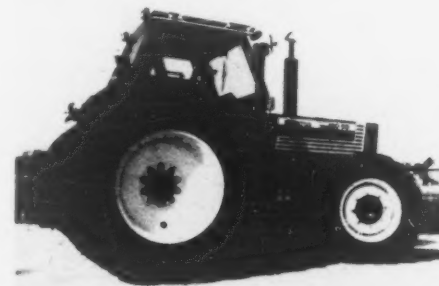
Observed Maximum Pressure psi (kPa)	2500 (17240)
Location	rear axle
Hydraulic oil temperature °F (°C)	188 (87)
Location	hydraulic filter
	Maximum Lift Capacity
QUICK ATTACH CATEGORY	II
LOAD lbs (kg)	12092 (5485)
TIME sec	5.48
HITCH POINT MOVEMENT in (mm)	
Lowest position	15.5 (341)
Top of timed range	57.5 (953)
Highest position	58.2 (970)
LOAD CG MOVEMENT in (mm)	
Lowest position	14.6 (371)
Top of timed range	38.0 (965)
Highest position	38.7 (983)

*Implement load capacity for transport purposes not specified by manufacturer



Hitch Dimensions as Tested — No Load

	inch	mm
A	31.0	787
B	10.8	275
C	16.9	430
D	16.1	409
E	9.0	229
F	11.0	280
G	33.8	858
H	2.5	64
I	16.7	425
J	22.8	578
K	21.5	546
L	48.5	1232
M	26.2	665
N	40.0	1016
O	8.0	203
P	41.8	1060
Q	36.9	937
R	35.4	899



Heaton 180-90 Powershift Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Ervin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1551—INTERNATIONAL 3088 DIESEL 16 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °C			Barometer mb Hg (kPa)
		gal/hr (L/hr)	lb/hp-hr (kg/kW-hr)	Hp-hr gal (kW-hr/L)	Cooling medium	Air wet bulb		Air dry bulb
MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed—Two hours (PTO Speed—1159 rpm)							
81.55 (60.66)	2400	5.465 (20.68)	0.469 (0.285)	14.88 (2.93)	186 (85.6)	59 (15.1)	28.97 (97.81)
Standard Power Take-off Speed (1000 rpm)—One Hour							
80.28 (59.87)	2072	5.009 (18.96)	0.435 (0.265)	16.03 (3.158)	187 (85.8)	59 (15.0)	28.95 (97.74)
VARYING POWER AND FUEL CONSUMPTION—Two Hours							
72.31 (53.82)	2511	5.141 (19.46)	0.496 (0.302)	14.06 (2.71)	184 (84.4)	59 (14.7)	27.5 (91.9)
6.00 (0.00)	2637	2.098 (7.94)	— (—)	— (—)	182 (81.3)	58 (14.2)	27.5 (91.9)
36.83 (27.46)	2558	3.495 (13.22)	0.662 (0.403)	10.54 (2.078)	185 (85.8)	59 (14.7)	27.1 (91.5)
81.83 (61.02)	2400	5.472 (20.74)	0.467 (0.284)	14.95 (2.946)	186 (85.6)	60 (15.6)	26.4 (90.4)
18.88 (14.08)	2620	2.816 (10.658)	1.041 (0.63)	6.71 (1.32)	182 (81.3)	59 (15.0)	27.5 (91.9)
55.08 (41.08)	2549	4.505 (16.28)	0.545 (0.332)	12.80 (2.52)	185 (86.2)	60 (15.6)	26.2 (90.4)
Av 44.15 (32.93)	2546	3.887 (14.71)	0.614 (0.374)	11.36 (2.238)	183 (84.4)	59 (15.0)	28.99 (97.79)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. °F/C			Barom. mm Hg (kPa)
					gal/hr (L/hr)	lb/hp-hr (kg/kW-hr)	Cool- ing med	Air wet- bulb	Air dry- bulb	
Maximum Available Power — Two Hours 8th (H1) Gear										
70.31 (52.43)	5100 (22.68)	5.17 (8.32)	2401 (18.2)	4.63 (0.33)	5.474 (20.72)	0.543 (0.33)	12.84 (2.31)	185 (85.0)	46 (7.5)	57 (13.6)
75% of Pull at Maximum Power — Ten Hours 8th (H1) Gear										
55.56 (41.43)	3841 (17.09)	5.42 (8.73)	2489 (18.73)	3.50 (0.26)	4.794 (18.14)	0.602 (0.36)	11.59 (2.28)	183 (84.0)	50 (13.1)	52 (9.02)
50% of Pull at Maximum Power — Two Hours 8th (H1) Gear										
58.46 (43.68)	2561 (11.39)	5.63 (9.08)	2554 (19.08)	2.34 (0.43)	3.940 (14.91)	0.715 (0.43)	9.76 (1.92)	183 (81.9)	50 (12.8)	59 (98.8)
50% of Pull at Reduced Engine Speed — Two Hours 12th (H4) Gear										
58.46 (43.68)	2560 (11.39)	5.63 (9.07)	1634 (12.26)	2.31 (0.33)	3.045 (11.32)	0.553 (0.33)	12.63 (2.48)	184 (84.4)	48 (9.9)	56 (13.1)
MAXIMUM POWER IN SELECTED GEARS										
62.88 (46.89)	10995 (48.91)	2.14 (3.43)	2491 (18.73)	14.70 (10.78)	4th (L4) Gear		183 (81.9)	54 (12.1)	58 (13.1)	29.14 (98.40)
69.16 (51.32)	7827 (34.82)	3.31 (5.33)	2401 (18.2)	7.39 (5.33)	5th (L5) Gear		184 (84.4)	50 (13.9)	45 (12.2)	29.14 (98.40)
69.58 (51.74)	6588 (29.70)	3.95 (6.38)	2399 (18.2)	6.15 (4.51)	6th (L6) Gear		185 (84.7)	42 (11.5)	49 (12.2)	29.15 (98.32)
69.60 (51.80)	5767 (25.65)	4.55 (7.28)	2400 (18.2)	5.24 (3.78)	7th (L7) Gear		185 (84.7)	42 (11.5)	49 (12.2)	29.15 (98.32)
71.20 (53.09)	5175 (23.02)	5.16 (8.30)	2397 (18.2)	4.59 (3.30)	8th (H1) Gear		185 (84.7)	36 (12.2)	40 (14.4)	29.14 (98.40)
70.19 (52.34)	4909 (21.83)	5.36 (8.63)	2399 (18.2)	4.45 (3.18)	9th (L8) Gear		185 (85.0)	42 (11.5)	50 (12.0)	29.12 (98.33)
70.64 (52.68)	4578 (19.25)	6.12 (9.83)	2490 (18.73)	3.87 (2.83)	10th (H2) Gear		185 (85.0)	42 (11.5)	50 (12.0)	29.12 (98.33)
70.50 (52.37)	3799 (16.90)	6.96 (11.20)	2399 (18.2)	3.55 (2.55)	11th (H3) Gear		185 (85.0)	43 (11.5)	51 (12.6)	29.11 (98.30)
68.76 (51.28)	3133 (13.94)	8.23 (13.23)	2399 (18.2)	2.83 (2.03)	12th (H4) Gear		185 (85.0)	44 (11.5)	52 (12.6)	29.11 (98.30)

Department of Agricultural Engineering

Dates of Test: November 8 to 13, 1984

Manufacturer: INTERNATIONAL HARVESTER COMPANY, 401 North Michigan Avenue, Chicago, Illinois 60611

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.8 (rating taken from oil company's inspection data) Specific gravity (converted to 60/60°F (15/15°C)) 0.8382 Fuel weight 6.979 lbs/gal (0.836 kg/l) Oil SAE 30 API service classification CD/SF To motor 2.502 gal (9.470 l) Drained from motor 2.275 gal (8.603 l) Transmission and final drive lubricant I.H. Hy-Tran fluid Total time engine was operated 35.0 hours.

ENGINE: Make International Diesel Type six cylinder vertical Serial No. 358D72D12082* Crankshaft lengthwise Rated rpm 2400 Bore and stroke 3.875" x 5.062" (98.4 mm x 128.6 mm) Compression ratio 16.4 to 1 Displacement 358 cu in (5867 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper cartridges Muffler underhood Exhaust vertical Cooling medium temperature control one thermostat.

CHASSIS: Type standard with duals Serial No. 2480005U001568* Tread width rear 60" (1524 mm) to 127.5" (3238 mm) front 60" (1524 mm) to 84" (2134 mm) Wheel base 104.8" (2662 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 28.5" (724 mm) Vertical distance above roadway 38.1" (968 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (2) range operator controlled powershift Advertised speeds mph (km/h) first 1.5 (2.4) second 1.8 (2.9) third 2.0 (3.2) fourth 2.4 (3.8) fifth 3.5 (5.6) sixth 4.1 (6.6) seventh 4.7 (7.5) eighth 5.3 (8.5) ninth 5.5 (8.8) tenth 6.2 (10.0) eleventh 7.0 (11.3) twelfth 8.3 (13.3) thirteenth 12.2 (19.6) fourteenth 14.3 (23.1) fifteenth 16.5 (26.2) sixteenth 19.1 (30.8) reverse 2.6 (4.2), 3.1 (4.9), 3.5 (5.6), 4.1 (6.5), 6.0 (9.7), 7.0 (11.3), 8.0 (12.9), 9.4 (15.1) Clutch single dry disc hydraulically power actuated and operated by foot pedal Brakes wet multiple disc hydraulically power actuated and operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 142.8" (3.63 m) left 142.8" (3.63 m) (on concrete surface without brake) right 174.6"

LUGGING ABILITY IN 8th (H1) GEAR

Crankshaft Speed rpm	2397	2165	1925	1681	1444	1201	964
Pull—lb (kN)	5175 (23.02)	5798 (25.79)	6298 (28.01)	6550 (29.14)	6952 (30.92)	6976 (31.03)	6678 (29.71)
Increase in Pull %	0	12	22	27	34	35	29
Power—Hp (kW)	71.20 (53.09)	71.56 (53.36)	68.69 (51.22)	62.27 (46.43)	56.52 (42.13)	47.12 (35.14)	36.52 (27.08)
Speed—Mph (km/h)	5.16 (8.30)	4.65 (7.45)	4.09 (6.58)	3.56 (5.74)	3.05 (4.91)	2.55 (4.08)	2.04 (3.28)
Slip %	4.59	5.09	5.66	6.08	6.50	6.50	6.50

TRACTOR SOUND LEVEL WITH CAB	dB(A)
Maximum Available Power—Two Hours	79.0
75% of Pull at Maximum Power—Ten Hours	80.0
50% of Pull at Maximum Power—Two Hours	78.0
50% of Pull at Reduced Engine Speed—Two Hours	76.5
Bystander in 15th (H7) gear	86.5

Tires, Ballast and Weight	With Ballast	Without Ballast
	Four 18.4-54, 6:12 (85)	Four 18.4-54, 6:12 (85)
Rear Tires	—No. size, ply and psi (kPa) —Load (each) —Load from (each inner)	None None None
Front Tires	—No. size, ply and psi (kPa) —Load (each) —Tire Equip (each)	Two 9.5L-15, 6:36 (250) None 45 lb (20 kg)
Height of Drawbar	19.5 in (495 mm)	19.5 in (495 mm)
Static Weight with Operator—Rear	9210 lb (4178 kg)	8740 lb (3964 kg)
—Front	3290 lb (1492 kg)	3200 lb (1452 kg)
—Total	12500 lb (5670 kg)	11940 lb (5416 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2325	16030
Location	remote	
Hydraulic oil temperature °F (°C)	155	68
Location	sump	
Maximum Lift Capacity		Lift Capacity for Transport
QUICK ATTACH CATEGORY	no	II
LOAD lbs (kg)	6705	3041
TIME sec	5.00	
HITCH POINT MOVEMENT in (mm)		
Lowest position	11.9	302
Top of timed range	35.9	911
Highest position	36.0	914
LOAD CG MOVEMENT in (mm)		
Lowest position	11.3	287
Top of timed range	35.6	903
Highest position	35.8	908

*Implement load capacity for transport purposes not specified by manufacturer.

(4.43 m) left 174.6" (4.43 m) Turning space diameter (on concrete surface with brake applied) right 301.4" (7.66 m) left 301.4" (7.66 m) (on concrete surface without brake) right 365.2" (9.28 m) left 365.2" (9.28 m) Power take-off 540 rpm at 2106 engine rpm and 1000 rpm at 2072 engine rpm Unladen tractor mass 10820 lb (4908 kg).

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

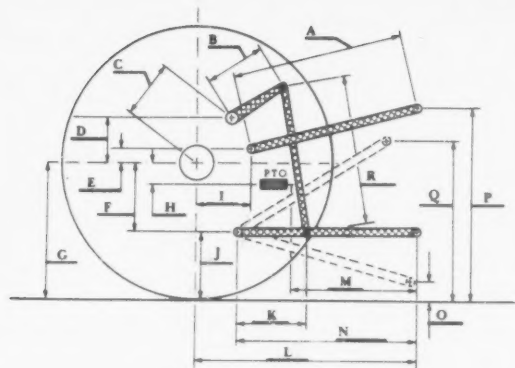
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 104°F (40°C). Nine gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1551, December 10, 1984.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	28.0	711
B	15.0	381
C	18.0	458
D	16.4	416
E	9.2	233
F	9.7	245
G	29.9	755
H	0.7	18
I	16.0	406
J	20.2	514
K	22.0	559
L	44.3	1124
M	22.0	559
N	33.6	852
O	6.5	165
P	39.3	997
Q	34.0	864
R	29.8	756

*To 1000 RPM shaft



International 3088 Diesel

NEBRASKA TRACTOR TEST 1585—KUBOTA L2250 4WD DIESEL ALSO KUBOTA L2250 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)				Barometer inch Hg (kPa)
		gal/hr (l/h)	Bhp/hr (kW)	Hp br gal (kW h/l)	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (FTO Speed — 577 rpm)								
21 15 (15.77)	2599	1.270 (4.806)	0.421 (0.256)	16.66 (3.282)	187 (86.3)	58 (14.5)	75 (23.6)	29.04 (98.07)
Standard Power Take-off Speed (540 rpm) — One Hour								
21 45 (16.00)	2432	1.249 (4.728)	0.408 (0.248)	17.18 (3.381)	191 (88.3)	59 (15.1)	75 (24.1)	29.03 (98.03)
VARYING POWER AND FUEL CONSUMPTION — Two Hours								
18.28 (13.61)	2649	1.125 (4.258)	0.432 (0.262)	16.25 (3.202)	184 (84.4)	59 (15.0)	75 (23.9)	
0.00 (0.00)	2784	0.411 (1.554)			180 (82.2)	59 (15.0)	75 (23.9)	
9.36 (6.98)	2705	0.731 (2.769)	0.548 (0.333)	12.80 (2.521)	182 (83.3)	60 (15.3)	76 (24.2)	
20.93 (15.61)	2603	1.240 (4.695)	0.416 (0.253)	16.88 (3.325)	187 (86.1)	60 (15.6)	76 (24.4)	
4.76 (3.55)	2737	0.599 (2.267)	0.882 (0.517)	7.95 (1.566)	181 (82.5)	60 (15.3)	75 (23.9)	
15.90 (10.76)	2679	0.920 (3.481)	0.464 (0.282)	15.11 (2.972)	185 (85.9)	59 (15.0)	75 (23.9)	
Av (8.34)	11.21 2696	0.838 (3.171)	0.534 (0.319)	15.38 (2.835)	183 (83.8)	59 (15.2)	75 (24.8)	29.04 (98.86)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. (°F/°C)				Barom. in. Hg (kPa)
					gal/hr (l/h)	Bhp/hr (kW)	Air wet bulb	Air dry bulb	Air H ₂ O in. Hg (kPa)		
Maximum Available Power — Two Hours 6th (H-2) Gear											
16.88 (12.59)	1260 (5.60)	5.03 (8.09)	2600	8.61	1.255 (4.749)	0.521 (0.317)	15.46 (2.851)	187 (86.1)	48 (15.6)	57 (17.6)	28.59 (96.31)
75% of Pull at Maximum Power — Ten Hours 6th (H-2) Gear											
15.62 (10.16)	964 (4.29)	5.31 (8.53)	2676	6.42	1.102 (4.172)	0.567 (0.345)	12.36 (2.435)	186 (85.3)	44 (16.6)	54 (12.1)	28.76 (97.12)
50% of Pull at Maximum Power — Two Hours 6th (H-2) Gear											
9.54 (6.96)	644 (2.86)	5.44 (8.76)	2695	4.52	0.875 (3.114)	0.657 (0.406)	10.67 (2.102)	185 (85.0)	45 (16.9)	49 (17.6)	28.92 (97.60)
50% of Pull at Reduced Engine Speed — Two Hours 7th (H-3) Gear											
9.54 (6.97)	644 (2.86)	5.44 (8.76)	1715	4.61	0.739 (2.796)	0.554 (0.337)	12.65 (2.492)	186 (85.3)	43 (16.1)	47 (18.1)	28.68 (96.85)

MAXIMUM POWER IN SELECTED GEARS

Power—Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	6th (H-2) Gear	5th (H-1) Gear	4th (L-4) Gear
12.40 (9.24)	2105 (9.35)	2.21 (3.56)	2678	14.92	185 (85.0)
17.00 (12.68)	1854 (8.24)	5.44 (8.76)	2599	12.94	186 (85.3)
17.28 (12.89)	1285 (5.72)	5.04 (8.12)	2601	8.36	186 (85.3)
16.03 (11.96)	732 (3.25)	8.22 (13.21)	2599	4.84	186 (85.3)

LUGGING ABILITY IN 6th (H-2) GEAR

Crankshaft Speed rpm	2601	2354	2083	1819	1564	1313
Pull—lb (kN)	1285 (5.72)	1476 (6.57)	1626 (7.23)	1756 (7.81)	1800 (8.01)	1735 (7.72)
Increase in Pull %	0	15	27	37	40	35
Power—Hp (kW)	17.28 (12.89)	17.55 (13.09)	17.06 (12.72)	15.90 (11.83)	13.94 (10.39)	11.34 (8.46)
Speed—Mph (km/h)	5.04 (8.12)	4.46 (7.18)	3.94 (6.33)	3.39 (5.46)	2.90 (4.67)	2.45 (3.94)
Slip %	8.36	9.69	10.67	11.86	12.25	11.86

Department of Agricultural Engineering

Dates of Test: October 28 to November 5, 1985

Manufacturer: KUBOTA, LTD., 2-47, Shikitsuhigashi 1-chome, Naniwaku, Osaka, Japan

FUEL, OIL, AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8424 Fuel weight 7.014 lbs/gal (0.841 kg/l) Oil SAE 20W API service classification CC-CD-SE To motor 1.088 gal (4.120 l) Drained from motor 1.097 gal (4.154 l) Transmission and final drive lubricant Shell Donax TD or equivalent Front axle lubricant SAE 80-90 gear oil Total time engine was operated 39.5 hours.

ENGINE: Make Kubota Diesel Type three cylinder vertical Serial No. D1502-D1-A-11943 Crankshaft lengthwise Rated rpm 2600 Bore and stroke 3.23" × 5.23" (82 mm × 133 mm) Compression ratio 18 to 1 Displacement 79.3 cu in (1299 ml) Starting system 12 volt Lubrication pressure Air cleaner one paper element Oil filter one full flow cartridge Fuel filter one paper element Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. L2250D-51189 Tread width rear 40.0" (1015 mm) to 44.7" (1135 mm) front 39.8" (1010 mm) Wheel base 64.6" (1640 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 30.3" (770 mm) Vertical distance above roadway 28.5" (725 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 0.9 (1.4) second 1.2 (1.9) third 1.9 (3.0) fourth 2.7 (4.3) fifth 4.2 (6.7) sixth 5.8 (9.4) seventh 9.1 (14.7) eighth 12.9 (20.8) reverse 0.8 (1.3), 1.1 (1.7), 1.7 (2.7), 2.4 (3.9), 3.8 (6.0), 5.2 (8.4), 8.2 (13.2) Clutch single dry disc operated by foot pedal Brakes multiple wet disc operated by two foot pedals which can be locked together Steering mechanical Turning radius (on concrete surface with brake applied) right 87" (2.2 m) left 87" (2.2 m) (on concrete surface without brake) right 95" (2.4 m) left 95" (2.4 m) Turning space diameter (on concrete surface with brake applied) right 181" (4.6 m) left 181" (4.6 m) (on concrete surface without brake) right 197" (5.0 m) left 197" (5.0 m) Power take-off 540 rpm at 2432 engine rpm Unladen tractor mass 2425 lb (1100 kg).

TRACTOR SOUND LEVEL WITHOUT CAB		
	Front Wheel Drive Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours	90.5	89.5
75% of Pull at Maximum Power—Ten Hours		90.0
50% of Pull at Maximum Power—Two Hours		89.5
50% of Pull at Reduced Engine Speed—Two Hours		87.0
Bystander in 8th (H-4) gear		82.0

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	hp/hr (kW/h)	Coef- ficient	Air wet bulb	Air dry bulb	Baro.m in. (kPa)
Maximum Available Power — Two Hours 6th (H-2) Gear										
16.84 (12.34)	1195 (5.31)	5.29 (8.52)	2599	6.14	1.283 (4.837)	0.554 (0.323)	13.13 (2.186)	188 (86.4)	49 (9.2)	28.52 (15.3)
MAXIMUM POWER IN SELECTED GEARS										
15.98 (11.92)	2675 (11.89)	2.24 (3.61)	2646	14.84	4th (L-4) Gear	186 (83.3)	39 (1.9)	41 (9.0)	28.72 (16.06)	
17.11 (12.76)	1757 (7.72)	5.69 (9.15)	2600	8.86	5th (H-1) Gear	186 (83.3)	44 (6.7)	49 (9.4)	28.97 (16.13)	
17.20 (12.61)	1216 (5.41)	5.50 (8.84)	2601	6.07	6th (H-2) Gear	186 (83.3)	42 (5.6)	46 (7.8)	28.99 (16.19)	

TIRES, BALLAST AND WEIGHT

Base Tires		With Ballast	Without Ballast
—No., size, ply & psi (kPa)	Two 9.5-24, 4, 14 (95)	Two 9.5-24, 4, 14 (95)	Two 9.5-24, 4, 14 (95)
—Liquid (each)	175 lb (79 kg)	175 lb (79 kg)	None
—Cast iron (each)	48 lb (22 kg)	48 lb (22 kg)	None
Front Tires		With Ballast	Without Ballast
—No., size, ply & psi (kPa)	Two 6-14, 4, 28 (195)	Two 6-14, 4, 28 (195)	Two 6-14, 4, 28 (195)
—Liquid (each)	None	None	None
—Cast iron (each)	42 lb (19 kg)	42 lb (19 kg)	None
Height of Drawbar	15 in (310 mm)	15 in (310 mm)	15 in (310 mm)
Static Weight with Operator—Rear	1900 lb (862 kg)	1455 lb (660 kg)	1455 lb (660 kg)
—Front	1230 lb (558 kg)	1145 lb (519 kg)	1145 lb (519 kg)
—Total	5150 lb (2320 kg)	2600 lb (1179 kg)	2600 lb (1179 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2250 (155.0)	
Location	lift cylinder	
Hydraulic oil temperature °F (°C)	164 (73)	
Location	hydraulic filter	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	1	*not measured
LOAD lbs (kg)	1540 (699)	
TIME sec	2.51	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.5 (312)	
Top of timed range	52.5 (1320)	
Highest position	** 52.5 (1320)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.4 (290)	
Top of timed range	57.7 (1468)	
Highest position	58.5 (1486)	

*Implement load capacity for transport purposes not specified by manufacturer

** The observed power range 20.2 in (514 mm) is less than the minimum power range for Cat 1, 22 in (559 mm) specified by ASAE Standard S217.10

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

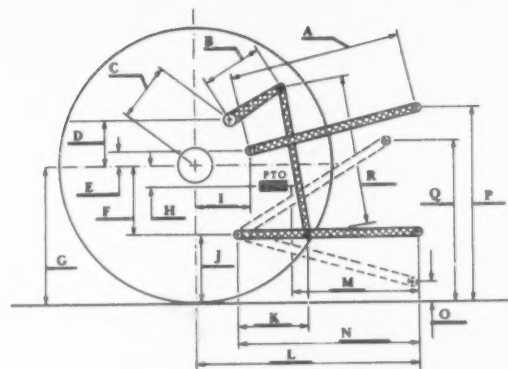
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 111°F (43.9°C). Four gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1585, December 4, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	25.0	635
B	9.1	230
C	12.0	305
D	12.0	305
E	9.9	251
F	3.4	85
G	19.1	485
H	-0.6	-16
I	4.7	120
J	15.8	400
K	11.2	285
L	29.2	742
M	22.4	569
N	24.8	630
O	6.5	165
P	53.8	1367
Q	28.9	733
R	17.0	432



Kubota L2250 4WD Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1586—KUBOTA L2550 4WD DIESEL ALSO KUBOTA L2550 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)			Barometer in. Hg (kPa)
		gal/hr (L/h)	lb/hp hr (kg/kW h)	Hp/hr gal (kW/kW h)	Cooling medium	wet bulb	
						air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed — Two hours (PTO Speed — 610 rpm)							
23.98 (17.88)	2600	1.470 (5.564)	0.450 (0.261)	16.32 (12.14)	198 (91.1)	58 (14.1)	75 (21.9)
Standard Power Take-off Speed (541 rpm) — One Hour							
24.24 (18.07)	2304	1.467 (5.551)	0.425 (0.258)	16.52 (12.54)	210 (98.7)	55 (13.0)	76 (24.3)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/h)	hp/hp hr (kW/kW h)	Temp °F (°C)	Cooling medium	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
21.26 (15.85)	2708	1.545 (5.804)	0.445 (0.270)	15.85 (9.18)	189 (86.6)	55 (12.5)	75 (21.9)	
0.00 (0.00)	2847	0.466 (1.765)		179 (81.7)	54 (12.2)	74 (21.3)		
10.88 (8.12)	2779	0.851 (3.222)	0.548 (0.334)	12.79 (2.519)	181 (82.8)	55 (12.5)	74 (21.3)	
24.21 (18.06)	2600	1.463 (5.537)	0.424 (0.258)	16.55 (12.61)	195 (90.6)	55 (12.8)	76 (24.4)	
5.54 (4.13)	2822	0.642 (2.429)	0.813 (0.494)	8.63 (1.700)	180 (81.9)	56 (13.1)	75 (21.9)	
16.17 (12.06)	2752	1.074 (4.064)	0.466 (0.283)	15.06 (2.967)	185 (83.9)	55 (12.8)	75 (21.9)	
Ar 28.76 (21.07)	2751	0.973 (3.683)	0.525 (0.319)	13.37 (2.610)	194 (89.6)	55 (12.8)	75 (21.8)	28.76 (97.13)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/h)	hp/hp hr (kW/kW h)	Temp °F (°C)	Cooling medium	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
Maximum Available Power — Two Hours 6th (H-2) Gear										
19.76 (14.74)	1421 (6.32)	5.22 (8.40)	2600 (8.40)	8.00 (3.00)	1.490 (5.640)	0.529 (0.322)	15.27 (2.613)	47 (8.1)	58 (14.2)	29.10 (98.25)
75% of Pull at Maximum Power — Ten Hours 6th (H-2) Gear										
16.12 (12.02)	1089 (4.84)	5.55 (8.93)	2745 (8.93)	7.27 (2.66)	1.802 (6.627)	0.566 (0.346)	12.39 (2.440)	185 (84.9)	39 (13.9)	29.00 (97.92)
50% of Pull at Maximum Power — Two Hours 6th (H-2) Gear										
11.11 (8.28)	726 (3.23)	5.74 (9.23)	2775 (9.23)	5.19 (1.986)	1.053 (3.804)	0.665 (2.078)	10.55 (84.2)	184 (84.2)	35 (11.9)	29.00 (97.93)
50% of Pull at Reduced Engine Speed — Two Hours 7th (H-3) Gear										
11.11 (8.29)	727 (3.23)	5.75 (9.22)	1766 (9.22)	5.55 (2.02)	0.890 (3.170)	0.562 (0.342)	12.48 (2.438)	184 (84.4)	35 (11.7)	29.01 (97.95)

MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/h)	hp/hp hr (kW/kW h)	Temp °F (°C)	Cooling medium	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
15.29 (11.40)	2446 (10.88)	2.54 (4.17)	2751 (9.17)	14.78 (5.77)	4th (L-4) Gear	184 (84.4)	41 (5.0)	45 (12.2)	28.84 (97.39)	
19.81 (14.77)	2080 (9.25)	5.57 (8.93)	2600 (8.40)	12.50 (4.57)	5th (H-1) Gear	188 (86.4)	42 (5.6)	50 (10.0)	29.14 (98.40)	
20.25 (15.08)	1452 (6.46)	5.22 (8.41)	2602 (8.41)	7.89 (2.87)	6th (H-2) Gear	189 (87.2)	45 (7.2)	54 (12.2)	29.12 (98.33)	
18.64 (13.90)	825 (3.67)	8.48 (13.64)	2600 (8.40)	4.84 (1.77)	7th (H-3) Gear	191 (86.1)	45 (8.1)	51 (10.6)	29.15 (98.37)	

LUGGING ABILITY IN 6th (H-2) GEAR

Crankshaft Speed rpm	2602	2342	2084	1815	1564	1299
Pull—lb (kN)	1452 (6.46)	1664 (7.40)	1839 (8.18)	1895 (8.42)	1904 (8.47)	1854 (8.25)
Increase in Pull %	0	15	27	30	31	28
Power—Hp (kW)	20.25 (15.08)	20.56 (15.11)	19.92 (14.65)	17.75 (13.24)	15.40 (11.48)	12.50 (9.32)
Speed—Mph (km/h)	5.22 (8.41)	4.65 (7.46)	4.06 (6.54)	3.52 (5.66)	3.03 (4.88)	2.55 (4.07)
Slip %	7.89	9.41	10.59	11.00	11.16	10.75

Department of Agricultural Engineering

Dates of Test: October 28 to November 13, 1985

Manufacturer: KUBOTA, LTD., 2-47 Shikitsuhigashi, 1-chome, Nanuwaku, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8424 Fuel weight 7.014 lbs/gal (0.841 kg/l) Oil SAE 20W API service classification CC-CD-SE To motor 1.152 gal (4.360 l) Drained from motor 1.107 gal (4.189 l) Transmission and final drive lubricant Shell Donax TD or equivalent Front axle lubricant SAE 80-90 gear oil Total time engine was operated 46.5 hours.

ENGINE: Make Kubota Diesel Type three cylinder vertical Serial No. D1402-D1-A-11759 Crankshaft lengthwise Rated rpm 2600 Bore and stroke 3.35" x 3.25" (85 mm x 82 mm) Compression ratio 18 to 1 Displacement 85.1 cu in (1.395 m³) Starting system 12 volt Lubrication pressure Air cleaner one paper element Oil filter one full flow cartridge Fuel filter one paper element Fuel filter vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. L2550D-51511 Tread width rear 40.6" (1030 mm) to 55.1" (1400 mm) front 44.1" (1120 mm) Wheel base 64.6" (1640 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 29.7" (753 mm) Vertical distance above roadway 29.0" (737 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 0.9 (1.5) second 1.3 (2.0) third 2.0 (3.2) fourth 2.8 (4.5) fifth 4.4 (7.0) sixth 6.1 (9.8) seventh 9.5 (15.4) eighth 13.5 (21.7) reverse 0.8 (1.3), 1.1 (1.8), 1.8 (2.9), 2.5 (4.0), 3.9 (6.3), 5.5 (8.8), 8.6 (13.8) Clutch dual dry disc in combination with PTO operated by foot pedal Brakes multiple wet disc operated by two foot pedals which can be locked together Steering mechanical Turning radius (on concrete surface with brake applied) right 90° (2.3 m) left 90° (2.3 m) (on concrete surface without brake) right 98° (2.5 m) left 98° (2.5 m) Turning space diameter (on concrete surface with brake applied) right 189" (4.8 m) left 189" (4.8 m) (on concrete surface without brake) right 205" (5.2 m) left 205" (5.2 m) Power take-off 541 rpm at 2304 engine rpm Unladen tractor mass 2575 lb (1168 kg).

Front Wheel Drive Engaged (A) Disengaged

TRACTOR SOUND LEVEL WITHOUT CAB

Maximum Available Power—Two Hours	91.0	91.0
75% of Pull at Maximum Power—Ten Hours		91.0
50% of Pull at Maximum Power—Two Hours		89.5
50% of Pull at Reduced Engine Speed—Two Hours		86.5
Bystander in 8th (H-4) gear		83.0

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power (hp (kW)	Drawbar pull (lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Ship % gear	Fuel Consumption gal/hr for Mechanical (L/hr (kW h) (kW h)	Temp °F (°C)	Air cool ing med	Air wet bulb	Air dry bulb	Barom. (in. Hg (kPa)
Maximum Available Power — Two Hours 6th (H-2) Gear										
19.96 (14.88)	1381 (6.14)	5.42 (8.72)	2600 (8.40)	5.04 (1.85)	1.483 (5.613)	0.521 (0.317)	13.46 (2.651)	192 (88.9)	49 (9.4)	29.05 (98.10)

MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/h)	hp/hp hr (kW/kW h)	Temp °F (°C)	Cooling medium	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
14.61 (10.88)	3278 (14.58)	1.67 (2.68)	2754 (9.17)	14.78 (5.77)	3rd (L-3) Gear	184 (84.4)	44 (6.7)	51 (10.6)	28.82 (97.32)	
20.51 (15.14)	2014 (9.06)	5.78 (9.09)	2601 (8.40)	12.50 (4.57)	5th (H-1) Gear	187 (86.1)	41 (5.0)	49 (9.4)	29.15 (98.44)	
20.19 (15.05)	1390 (6.21)	5.42 (8.71)	2601 (8.40)	5.09 (1.85)	6th (H-2) Gear	193 (89.2)	49 (9.4)	60 (15.6)	29.05 (98.10)	

TIRES, BALLAST AND WEIGHT

Rate Time Ballast	With Ballast Two 11-24, 4, 14 (95) —Lugfoot (each) —Cast Iron (each)	Without Ballast Two 11-24, 4, 14 (95) None None
Front Tires Ballast	Two 7-16, 4, 26 (180) —Lugfoot (each) —Cast Iron (each)	Two 7-16, 4, 26 (180) None None
Height of Drawbar	15 in. (130 mm)	15 in. (130 mm)
Static Weight with Operator—Rear	2560 lb (1170 kg)	1555 lb (705 kg)
—Front	1490 lb (676 kg)	1195 lb (542 kg)
—Total	5850 lb (2646 kg)	2750 lb (1241 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2250 (155/10)	
Location	lift cylinder	
Hydraulic oil temperature °F (°C)	169 (76)	
Location	hydraulic filter	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	1	*not measured
LOAD lbs (kg)	1936 (887)	
TIME sec	2.66	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.1 (307)	
Top of timed range	32.1 (815)	
Highest position	** 52.4 (1322)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.3 (287)	
Top of timed range	38.0 (965)	
Highest position	58.5 (978)	

*Implement load capacity for transport purposes on specified by manufacturer
** The observed power range, 20.5 in (515 mm) is less than the minimum power range for Cat 1, 22 in (559 mm) specified by ASAE Standard S217.10

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

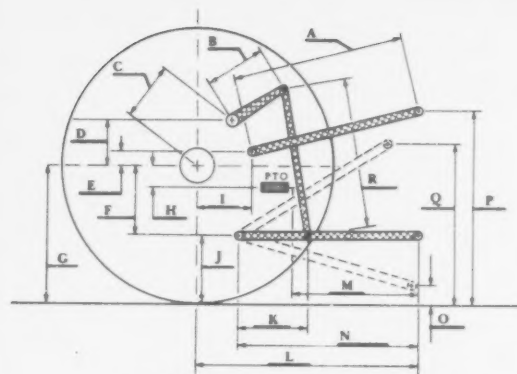
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 116°F (46.7°C). Four gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1586, December 4, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	24.8	629
B	9.1	230
C	12.0	305
D	12.0	305
E	9.9	251
F	3.4	85
G	19.3	488
H	-0.6	-16
I	4.7	120
J	15.9	403
K	11.2	285
L	29.2	742
M	22.4	569
N	24.8	610
O	6.4	162
P	53.9	860
Q	29.5	749
R	17.0	432



Kubota L2550 4WD Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omitvedt, Dean and Director

NEBRASKA TRACTOR TEST 1587—KUBOTA L2850 4WD DIESEL ALSO KUBOTA L2850 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power shaft (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)				Barometric inches Hg
		gal/hr (L)	lb/hp-hr (kg/kW-h)	Cooling medium	Air wet bulb	Air dry bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed — 811 rpm)								
27.51 (20.51)	2600	1.692 (6.403)	0.431 (0.262)	16.26 (3.204)	205 (96.2)	57 (13.7)	75 (24.0)	29.12 (98.12)
Standard Power Take-off Speed (546 rpm) — One Hour								
27.96 (20.85)	2298	1.647 (6.231)	0.413 (0.251)	16.98 (3.144)	221 (105.1)	56 (13.1)	75 (23.7)	29.07 (98.17)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

23.76 (17.72)	2642 (6.60)	1.501 (0.235)	0.445 (3.118)	15.85 (94.2)	202 (81.9)	55 (13.1)	75 (23.1)	
0.00 (0.00)	2816 (9.11)	0.556 (1.756)	— (0.346)	— (2.426)	180 (81.3)	56 (13.9)	74 (21.6)	
12.22 (9.11)	2719 (6.23)	0.992 (0.251)	0.569 (3.144)	12.52 (105.1)	182 (105.1)	57 (13.9)	75 (23.7)	
28.02 (20.85)	2600 (6.03)	1.698 (0.262)	0.425 (3.204)	16.50 (105.1)	202 (96.2)	58 (14.4)	76 (24.2)	
6.25 (4.66)	2778 (6.60)	0.783 (2.361)	0.879 (0.515)	7.98 (1.572)	180 (81.9)	58 (14.4)	77 (24.7)	
18.08 (13.48)	2682 (6.64)	1.228 (0.290)	0.476 (2.901)	14.73 (85.0)	185 (85.0)	58 (14.4)	76 (24.4)	
14.72 (10.98)	2706 (6.24)	1.186 (0.324)	0.537 (3.373)	13.87 (84.8)	188 (84.8)	57 (13.9)	75 (23.8)	29.04 (98.07)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (L)	Specific fuel consumption (lb/hp-hr) (kg/kW-h)	Cool- ing medium	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)
Maximum Available Power — Two Hours 6th (H-3) Gear											
25.08 (17.21)	1727 (7.68)	5.01 (8.07)	2599 (6.07)	7.02 (1.71)	0.520 (0.716)	15.49 (2.438)	202 (96.2)	55 (12.8)	70 (20.6)	28.61 (96.61)	
75% of Pull at Maximum Power — Ten Hours 6th (H-3) Gear											
18.91 (14.10)	1347 (5.99)	5.27 (8.47)	2684 (6.67)	5.41 (1.49)	0.555 (0.849)	12.68 (2.490)	186 (85.8)	59 (15.0)	47 (7.8)	28.84 (97.52)	
50% of Pull at Maximum Power — Two Hours 6th (H-3) Gear											
13.00 (9.43)	898 (3.99)	5.45 (8.74)	2729 (6.74)	4.05 (1.08)	0.642 (0.991)	10.92 (2.131)	185 (85.0)	59 (15.0)	46 (7.8)	28.88 (97.52)	
50% of Pull at Reduced Engine Speed — Two Hours 7th (H-3) Gear											
12.99 (9.66)	897 (3.99)	5.43 (8.73)	1734 (4.87)	3.90 (1.02)	0.575 (0.849)	15.35 (2.610)	189 (87.2)	45 (7.2)	59 (14.7)	28.81 (97.28)	

MAXIMUM POWER IN SELECTED GEARS

19.04 (14.19)	5145 (11.98)	2.27 (3.66)	2680 (6.67)	14.72 (3.71)	4th (L-4) Gear	186 (85.3)	55 (13.1)	58 (14.4)	28.88 (97.52)	
25.54 (17.40)	2542 (11.31)	5.44 (8.74)	2600 (6.60)	11.07 (2.81)	5th (H-1) Gear	200 (91.3)	55 (12.8)	70 (21.1)	28.66 (96.76)	
24.02 (17.91)	1796 (7.99)	5.02 (8.07)	2601 (6.60)	7.00 (1.80)	6th (H-2) Gear	200 (91.3)	54 (12.2)	68 (20.0)	28.70 (96.92)	
22.55 (16.65)	1050 (4.58)	8.15 (13.09)	2599 (6.60)	4.11 (1.08)	7th (H-3) Gear	199 (92.6)	55 (12.8)	70 (21.1)	28.64 (96.71)	

LUGGING ABILITY IN 6th (H-2) GEAR

Crankshaft Speed rpm	2601	2547	2082	1826	1556	1505
Pull—lb (kN)	1796 (7.99)	2024 (9.00)	2257 (9.95)	2559 (10.49)	2512 (10.26)	2241 (9.97)
Increase in Pull %	0	15	25	51	29	25
Power—Hp (kW)	24.02 (17.91)	26.14 (19.08)	25.40 (17.65)	21.48 (16.01)	17.94 (13.38)	14.65 (10.93)
Speed—Mph (km/h)	5.02 (8.07)	4.47 (7.20)	5.92 (9.51)	5.41 (8.71)	2.91 (4.68)	2.45 (3.93)
Slip %	7.00	8.15	9.27	9.91	9.81	9.36

Department of Agricultural Engineering

Dates of Test: October 30 to November 7, 1985

Manufacturer: KUBOTA, LTD., 2-47 Shikatsu-
higashi, 1-chome, Naniwaku, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 46.9 (rating taken from oil company's
inspection data) Specific gravity converted to 60°
60°F (15/15°C) 0.8424 Fuel weight 7.014 lb/gal
(0.841 kg/l) Oil SAE 20W API service classifica-
tion CC-CD-SE To motor 1.597 gal (6.045 l)
Drained from motor 1.518 gal (5.747 l) Trans-
mission and final drive lubricant Shell Donax TD
or equivalent Front axle lubricant SAE 80-90 gear
oil Total time engine was operated 39.5 hours.

ENGINE: Make Kubota Diesel Type four cyl-
inder vertical Serial No. V1702-D1-A-11519
Crankshaft lengthwise Rated rpm: 2600 Bore and
stroke 3.23" x 3.25" (82 mm x 82 mm) Compression
ratio 18 to 1 Displacement 105.7 cu in (1732
ml) Starting system 12 volt Lubrication pressure
Air cleaner one paper element Oil filter one full
flow cartridge Fuel filter one paper element Muf-
fler vertical Cooling medium temperature control
one thermostat.

CHASSIS: Type front wheel assist Serial No.
L2850D-50954 Tread width rear 41.3" (1050 mm)
to 59.6" (1515 mm) front 44.1" (1120 mm) Wheel
base 68.3" (1733 mm) Center of gravity (without
operator or ballast, with minimum tread, with fuel
tank filled and tractor serviced for operation) Hor-
izontal distance forward from center-line of rear
wheels 50.6" (777 mm) Vertical distance above
roadway 29.5" (750 mm) Horizontal distance from
center of rear wheel tread 0" (0 mm) to the right/
left Hydraulic control system direct engine drive
Transmission selective gear fixed ratio Advertised
speeds mph (km/h) first 0.8 (1.3) second 1.1
(1.8) third 1.8 (2.9) fourth 2.6 (4.2) fifth 3.9 (6.3)
sixth 5.5 (8.8) seventh 8.6 (13.8) eighth 12.7 (20.4)
reverse 0.7 (1.2), 1.0 (1.6), 1.6 (2.6), 2.4 (3.8), 3.5
(5.7), 4.9 (7.9), 7.7 (12.4) Clutch dual dry disc in
combination with PTO operated by foot pedal
Brakes multiple wet disc operated by two foot pe-
dals which can be locked together Steering me-
chanical Turning radius (on concrete surface with
brake applied) right 95° (2.4 m) left 95° (2.4 m) on
concrete surface without brake) right 110° (2.8 m)
left 110° (2.8 m) Turning space diameter (on con-
crete surface with brake applied) right 197" (5.0
m) left 197" (5.0 m) (on concrete surface without
brake) right 228" (5.8 m) left 228" (5.8 m) Power
take-off 540 rpm at 2298 engine rpm Unladen
tractor mass 2790 lb (1266 kg).

TRACTOR SOUND LEVEL WITHOUT CAB		Front Wheel Drive Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours		90.5	90.0
75% of Pull at Maximum Power—Ten Hours			89.5
50% of Pull at Maximum Power—Two Hours			90.0
50% of Pull at Reduced Engine Speed—Two Hours			87.5
Bystander in 8th (H-4) gear			91.5

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power (Hp)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	Oil/Sp. Hr (kg/kWh)	Oil/Sp. Hr (kg/kWh)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barom. atm Hg (kPa)
Maximum Available Power—Two Hours 6th (H-2) Gear											
25.16 (17.27)	1687 (7.56)	5.15 (8.25)	2599	4.63	1.704 (6.449)	0.516 (0.314)	15.59 (2.678)	202 (94.2)	54 (11.9)	65 (18.3)	28.59 (96.54)
MAXIMUM POWER IN SELECTED GEARS											
16.65 (12.00)	4030 (17.97)	1.55 (2.49)	2696	14.95	5th (L-3) Gear	185 (84.7)	35 (1.7)	40 (14.4)	28.90 (97.59)		
25.74 (17.71)	2477 (11.02)	5.60 (9.79)	2601	7.45	5th (H-1) Gear	200 (90.7)	55 (12.4)	69 (20.6)	28.68 (96.85)		
25.95 (17.84)	1744 (7.78)	5.14 (8.26)	2599	4.73	6th (H-2) Gear	199 (90.8)	55 (11.7)	66 (18.9)	28.72 (96.98)		

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires	—No. size, ply & psi (kPa)	Two 12-4.24, 4, 14 (95)
Ballast	—Liquid (each)	265 lb (120 kg)
	—Cast iron (each)	320 lb (145 kg)
Front Tires	—No. size, ply & psi (kPa)	Two 7-16, 4, 28 (180)
Ballast	—Liquid (each)	None
	—Cast iron (each)	222 lb (101 kg)
Height of Drawbar	15 in (380 mm)	15 in (380 mm)
Static Weight with Operator—Rear	2855 lb (1295 kg)	1685 lb (764 kg)
—Front	1725 lb (782 kg)	1280 lb (581 kg)
—Total	4580 lb (2077 kg)	2965 lb (1345 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2275 (15690)	
Location	lift cylinder	
Hydraulic oil temperature °F (°C)	189 (87)	
Location	hydraulic filter	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	I	*not measured
LOAD lbs (kg)	2046 (928)	
TIME sec	2.38	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.1 (308)	
Top of timed range	32.1 (816)	
Highest position	** 52.8 (1344)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.1 (282)	
Top of timed range	56.9 (1447)	
Highest position	57.9 (1470)	

*Implement load capacity for transport purposes not specified by manufacturer.

** The observed power range, 28.7 to 1500 mm is less than the minimum power range for Cat 1, 22 in. (559 mm) specified by ASAE Standard S217.10.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 106°F (42.1°C). Four gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1587, December 4, 1985.

LOUIS I. LEVITICUS

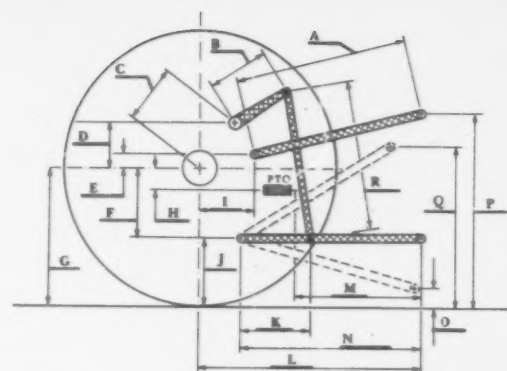
Engineer-in-Charge

K. VON BARGEN

W. E. SPLINTER

L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	27.1	689
B	9.1	230
C	10.7	272
D	10.6	270
E	8.5	216
F	4.4	111
G	20.9	530
H	0.8	20
I	3.1	79
J	16.5	419
K	12.2	309
L	29.8	757
M	22.9	583
N	26.8	680
O	6.6	168
P	34.5	876
Q	29.9	759
R	17.3	438



Kubota L2850 4WD Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Ostvedt, Dean and Director

NEBRASKA TRACTOR TEST 1588—KUBOTA L3350 4WD DIESEL ALSO KUBOTA L3350 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Brake hp (kW)	Hp-brake (kW)	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed — 626 rpm)								
52.86 (24.50)	2600	1.990 (7.314)	0.425 (0.236)	16.51 (12.252)	185 (87.9)	59 (14.8)	75 (21.8)	28.75 (97.01)

Standard Power Take-off Speed (540 rpm) — One Hour

33.29 (24.62)	2243	1.943 (7.336)	0.409 (0.249)	17.13 (13.174)	185 (85.2)	59 (15.2)	76 (24.3)	28.65 (96.75)
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VARYING POWER AND FUEL CONSUMPTION — Two Hours

28.61 (21.33)	2662	1.762 (6.671)	0.432 (0.261)	16.25 (13.198)	181 (82.5)	60 (15.3)	74 (21.3)	—
0.00 (0.00)	2859	0.624 (2.364)	—	—	178 (81.1)	59 (15.0)	74 (21.1)	—
14.71 (10.97)	2740	1.133 (4.291)	0.541 (0.329)	12.98 (10.156)	180 (82.2)	59 (15.0)	74 (21.3)	—
33.56 (24.68)	2599	2.010 (7.610)	0.425 (0.257)	16.60 (13.246)	184 (84.2)	60 (15.3)	75 (21.6)	—
7.51 (5.60)	2802	0.885 (3.351)	0.826 (0.503)	8.49 (6.672)	179 (81.7)	60 (15.6)	76 (24.2)	—
21.80 (16.26)	2709	1.424 (5.382)	0.458 (0.229)	15.51 (11.015)	181 (82.5)	60 (15.6)	75 (21.9)	—
Av (11.17)	17.67 2725	1.307 (4.946)	0.519 (0.318)	15.52 (12.663)	180 (82.4)	60 (15.3)	74 (21.6)	28.63 (96.66)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Ship %	Fuel Consumption gal/hr (L/hr)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)
Maximum Available Power — Two Hours 6th Gear									
26.49 (19.75)	2026 (9.01)	4.90 (7.89)	2600	7.61	1.989 (7.326)	0.527 (0.320)	13.52 (2.623)	185 (85.0)	46 (4.4)
75% of Pull at Maximum Power — Ten Hours 6th Gear									
21.72 (16.19)	1572 (6.99)	5.18 (8.34)	2692	5.78	1.699 (6.411)	0.549 (0.334)	12.78 (2.517)	185 (84.4)	54 (0.6)
50% of Pull at Maximum Power — Two Hours 6th Gear									
14.95 (11.15)	1048 (4.66)	5.35 (8.61)	2724	5.86	1.549 (5.708)	0.635 (0.385)	11.08 (2.183)	185 (85.0)	54 (11.9)
50% of Pull at Reduced Engine Speed — Two Hours 7th Gear									
14.94 (11.14)	1047 (4.66)	5.35 (8.61)	1658	5.69	1.151 (4.280)	0.551 (0.323)	13.21 (2.603)	186 (85.6)	49 (9.2)

MAXIMUM POWER IN SELECTED GEARS

24.82 (18.51)	5434 (15.27)	2.71 (4.36)	2655	15.00	4th Gear	185 (85.0)	58 (13.3)	42 (5.6)	28.78 (97.19)
26.61 (19.85)	2826 (12.57)	5.53 (8.66)	2599	10.79	5th Gear	186 (85.3)	46 (7.8)	59 (15.0)	28.79 (97.22)
27.49 (20.50)	3096 (13.72)	4.92 (7.92)	2600	7.33	6th Gear	185 (85.0)	45 (6.1)	55 (12.8)	28.80 (97.23)
25.28 (18.85)	1152 (5.06)	8.37 (13.48)	2600	5.86	7th Gear	185 (85.0)	45 (7.2)	58 (14.4)	28.79 (97.22)

LUGGING ABILITY IN 6th GEAR

Crankshaft Speed rpm	2600	2350	2077	1813	1558	1296
Pull—lbs (kN)	2096 (9.32)	2576 (10.72)	2635 (11.72)	2741 (12.19)	2645 (11.78)	2577 (11.68)
Increase in Pull %	0	15	26	31	26	23
Power—Hp (kW)	27.49 (20.50)	27.58 (20.57)	26.92 (20.07)	24.28 (18.11)	20.20 (15.06)	16.44 (12.26)
Speed—Mph (km/h)	4.92 (7.92)	4.55 (7.01)	5.83 (8.17)	5.52 (7.35)	2.87 (4.61)	2.59 (4.15)
Slip %	7.53	8.63	9.70	10.27	9.99	9.70

Department of Agricultural Engineering

Dates of Test: October 30 to November 12, 1985

Manufacturer: KUBOTA, LTD., 2-47, Shikutsu-higashi 1-chome Naniwakku, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8424 Fuel weight 7.014 lbs/gal (0.841 kg/l) Oil SAE 20W API service classification CC-CD-SE To motor 1.717 gal (6.499 l) Drained from motor 1.527 gal (5.781 l) Transmission and final drive lubricant Shell Donax TD or equivalent Front axle lubricant SAE 80-90 gear oil Total time engine was operated 57.5 hours.

ENGINE: Make Kubota Diesel Type four cylinder vertical Serial No. V1902-D1-A-10456 Crankshaft lengthwise Rated rpm 2600 Bore and stroke 5.35" x 5.25" (85 mm x 82 mm) Compression ratio 18 to 1 Displacement 113.6 cu in (1861 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow cartridge Fuel filter one paper element Muffler underhood Exhaust vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. L3350DT-50477 Tread width rear 48" (1220 mm) to 68" (1720 mm) front 50" (1265 mm) Wheel base 72.6" (1845 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 29.5" (750 mm) Vertical distance above roadway 29.0" (737 mm) Horizontal distance from center of rear wheel tread 0.4" (10 mm) to the right Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 0.9 (1.5) second 1.2 (2.0) third 2.0 (3.3) fourth 3.2 (5.0) fifth 4.0 (6.4) sixth 5.4 (8.6) seventh 8.8 (14.2) eighth 13.5 (21.7) reverse 0.9 (1.5), 1.2 (2.0), 2.0 (3.3), 3.1 (5.0), 3.9 (6.4), 5.3 (8.6), 8.7 (14.1), 13.4 (21.6) Clutch dual dry disc in combination with PTO operated by foot pedal Brakes multiple wet disc operated by two foot pedals which can be locked together Steering power assist Turning radius (on concrete surface with brake applied) right 106° (2.7 m) left 106° (2.7 m) (on concrete surface without brake) right 126° (7.2 m) left 126° (3.2 m) Turning space diameter (on concrete surface with brake applied) right 228" (5.8 m) left 228" (5.8 m) (on concrete surface without brake) right 263" (6.7 m) left 263" (6.7 m) Power take-off 540 rpm at 2243 engine rpm Unladen tractor mass 4010 lb (1819 kg).

TRACTOR SOUND LEVEL WITHOUT CAB	Front Wheel Drive	
	Engaged dB(A)	Disengaged
Maximum Available Power—Two Hours	92.5	92.0
75% of Pull at Maximum Power—Ten Hours	92.0	—
50% of Pull at Maximum Power—Two Hours	91.0	—
50% of Pull at Reduced Engine Speed—Two Hours	88.5	—
Byrander in 6th gear	85.5	—

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Ship %	Fuel Consumption gal/hr (L/hr)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)
Maximum Available Power — Two Hours 6th Gear									
26.66 (19.88)	1967 (8.75)	5.08 (8.18)	2598	5.35	1.975 (7.475)	0.519 (0.316)	15.50 (2.660)	186 (85.6)	44 (8.2)
MAXIMUM POWER IN SELECTED GEARS									
21.39 (15.95)	4450 (19.71)	1.81 (2.91)	2687	14.94	3rd Gear	185 (84.7)	55 (13.1)	59 (15.9)	28.79 (97.22)
27.56 (20.40)	2768 (12.31)	5.71 (9.17)	2600	7.42	5th Gear	186 (85.3)	46 (7.8)	60 (15.6)	28.79 (97.22)
27.55 (20.53)	2028 (9.02)	5.09 (8.19)	2600	5.22	6th Gear	185 (85.0)	44 (6.7)	57 (13.6)	28.80 (97.23)

TIRES, BALLAST AND WEIGHT

Rear Tires	With Ballast	Without Ballast
—No. size ply psi (kPa)	Two 15.5-24, 6, 22 (150)	Two 15.5-24, 6, 22 (150)
—Liquid (each)	250 lb (116 kg)	None
—Cast from (each)	207 lb (94 kg)	None
Front Tires	With Ballast	Without Ballast
—No. size ply psi (kPa)	Two 8-16, 6, 34 (235)	Two 8-16, 6, 34 (235)
—Liquid (each)	None	None
—Cast from (each)	115 lb (52 kg)	None
Height of Drawbar	14 in (355 mm)	14 in (355 mm)
Static Weight with Operator—Rear	3455 lb (1567 kg)	2530 lb (1147 kg)
—Front	1885 lb (853 kg)	1655 lb (751 kg)
—Total	5340 lb (2422 kg)	4185 lb (1890 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2525 (174.0)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	178 (81)	
Location	pump inlet	
Maximum Lift Capacity		Lift Capacity for Transport
QUICK ATTACH CATEGORY	00	*not measured
LOAD lbs (kg)	1	
TIME sec	2652 (1201)	
HITCH POINT MOVEMENT in (mm)		
Lowest position	8.7 (221)	
Top of timed range	30.7 (780)	
Highest position	32.0 (813)	
LOAD CG MOVEMENT in (mm)		
Lowest position	8.5 (216)	
Top of timed range	32.5 (826)	
Highest position	34.5 (876)	

*Implement load capacity for transport purposes not specified by manufacturer.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

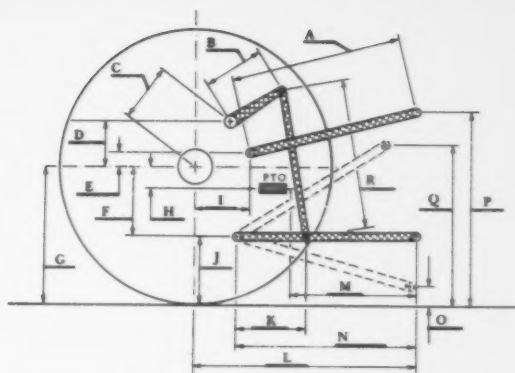
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power test, the fuel temperature at the injection pump inlet was maintained at 122°F (49.8°C). Four gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1588, December 4, 1985.

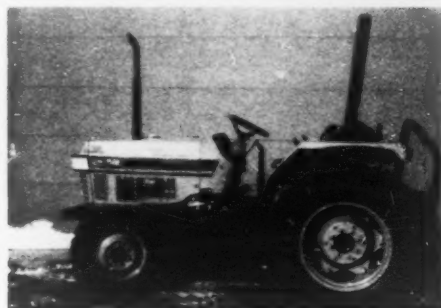
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

Board of Tractor Test Engineers



Hitch Dimensions as Tractor — No Load



Kubota L3350 4WD Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omsveldt, Dean and Director

	inch	mm
A	25.5	597
B	9.5	240
C	11.6	294
D	11.0	279
E	10.6	269
F	7.1	180
G	22.1	561
H	0.5	13
I	11.9	301
J	15.0	381
K	14.6	370
L	35.2	894
M	20.3	517
N	31.1	790
O	8.0	203
P	33.0	838
Q	32.1	816
R	18.5	470

NEBRASKA TRACTOR TEST 1555—KUBOTA L3750 4WD DIESEL ALSO KUBOTA L3750 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (liters)	Bhp/hr (kW)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed — 602 rpm)							
56.96 (27.56)	2500	2.232 (8.449)	0.421 (0.236)	16.56 (7.263)	186 (87.6)	56 (13.1)	29.12 (23.9)

Standard Power Take-off Speed (540 rpm) — One Hour							
56.81 (27.45)	2243	2.125 (8.044)	0.403 (0.245)	17.32 (7.913)	186 (86.5)	56 (13.2)	29.12 (24.1)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

51.89 (23.78)	2358	1.983 (7.397)	0.454 (0.264)	16.08 (7.274)	184 (84.2)	56 (13.1)	75 (23.6)
0.00 (0.00)	2687	0.701 (2.654)	—	—	179 (81.7)	56 (13.1)	75 (23.9)
16.29 (12.13)	2593	1.303 (4.994)	0.558 (0.339)	12.50 (5.662)	181 (82.2)	56 (13.1)	75 (23.9)
57.46 (27.91)	2500	2.234 (8.531)	0.420 (0.235)	16.62 (7.274)	187 (85.8)	56 (13.1)	76 (24.2)
8.30 (6.19)	2638	0.994 (3.742)	0.835 (0.508)	8.35 (3.843)	180 (81.9)	56 (13.1)	76 (24.4)
24.22 (18.06)	2570	1.635 (6.188)	0.471 (0.286)	14.92 (2.919)	182 (83.3)	56 (13.1)	76 (24.2)
19.89 (14.69)	2587	1.478 (5.594)	0.524 (0.318)	13.32 (6.024)	182 (83.3)	56 (13.2)	75 (24.0)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (liters)	Bhp/hr (kW)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power — Two Hours 6th (H2) Gear										
50.11 (22.45)	2281 (10.14)	4.95 (7.97)	2501	8.24	2.266 (8.576)	0.525 (0.319)	15.29 (2.618)	185 (89.0)	48 (3.6)	29.41 (99.10)
75% of Pull at Maximum Power — Ten Hours 6th (H2) Gear										
24.19 (16.04)	1759 (7.74)	5.22 (8.39)	2560	5.90	1.937 (7.333)	0.558 (0.340)	12.49 (2.660)	185 (84.8)	42 (5.4)	29.11 (11.0)
50% of Pull at Maximum Power — Two Hours 6th (H2) Gear										
16.62 (12.40)	1190 (5.16)	5.37 (8.65)	2597	4.06	1.556 (5.889)	0.533 (0.397)	10.69 (2.103)	184 (84.4)	52 (10.8)	28.88 (11.1)
50% of Pull at Reduced Engine Speed — Two Hours 7th (H3) Gear										
16.58 (12.36)	1159 (5.14)	5.36 (8.63)	1576	3.73	1.247 (4.722)	0.525 (0.319)	13.29 (2.618)	186 (85.3)	65 (15.2)	28.86 (10.74)

MAXIMUM POWER IN SELECTED GEARS

26.72 (19.92)	1641 (16.19)	2.75 (4.43)	2548	14.84	4th (L4) Gear	185 (85.0)	49 (9.4)	51 (10.6)	28.79 (97.22)
29.82 (22.21)	5175 (14.12)	3.52 (5.67)	2500	12.37	5th (H1) Gear	185 (84.7)	36 (2.2)	43 (6.1)	29.44 (99.41)
50.69 (22.88)	2319 (10.32)	4.96 (7.99)	2497	7.94	6th (H2) Gear	185 (84.7)	36 (2.2)	43 (6.1)	29.44 (99.41)
28.44 (21.21)	1262 (5.61)	8.45 (13.40)	2502	4.80	7th (H3) Gear	184 (84.4)	57 (2.8)	45 (7.2)	29.44 (99.41)

LUGGING ABILITY IN 6th (H2) GEAR

Crankshaft Speed rpm	2497	2243	2006	1751	1508	1249	1022
Pull—lbs (kN)	2519 (11.32)	2597 (11.35)	2775 (12.54)	2919 (13.24)	2981 (13.26)	3021 (13.44)	2971 (13.22)
Increase in Pull %	0	12	20	26	29	30	28
Power—Hp (kW)	30.69 (22.88)	30.48 (22.73)	28.86 (21.32)	26.24 (19.37)	22.97 (17.13)	19.21 (14.32)	15.51 (11.56)
Speed—mph (km/h)	4.96 (7.99)	4.40 (7.08)	3.90 (6.28)	3.57 (5.73)	2.89 (4.63)	2.58 (4.15)	1.96 (3.15)
Slip %	7.84	8.99	9.91	10.71	11.21	11.50	11.51

Department of Agricultural Engineering

Date of Test: March 25 to April 11, 1985

Manufacturer: KUBOTA, LTD., 2-47 Shikitsuhigashi, 1-chome, Naniwa-ku, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.3 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8376 Fuel weight 6.974 lbs/gal (0.836 kg/l) Oil SAE 20W API service classification CC, CD, SE To motor 2.202 gal (8.335 l) Drained from motor 2.119 gal (8.022 l) Transmission and hydraulic lubricant Shell Donax TD or equivalent Front axle lubricant SAE 80/90 gear oil Total time engine was operated 46.5 hours.

ENGINE: Make Kubota Diesel Type five cylinder vertical Serial No. F2502-DI-L-DC-32719 Crankshaft lengthwise Rated rpm 2500 Bore and stroke 3.35" x 5.23" (85 mm x 82 mm) Compression ratio 18 to 1 Displacement 142 cu in (2326 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow cartridge Fuel filter one paper element Muffler underhood Exhaust vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. L3750DT-50782 Tread width rear 52" (1320 mm) to 76" (1930 mm) front 52" (1320 mm) Wheel base 76.4" (1940 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 30.2" (767 mm) Vertical distance above roadway 31.0" (787 mm) Horizontal distance from center of rear wheel tread 0.5" (7 mm) to the right Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.0 (1.6) second 1.3 (2.1) third 2.2 (3.5) fourth 3.3 (5.3) fifth 4.2 (6.8) sixth 5.6 (9.1) seventh 9.2 (14.9) eighth 14.2 (22.8) reverse 1.0 (1.6), 1.3 (2.1), 2.1 (3.5), 3.3 (5.3), 4.2 (6.7), 5.6 (9.0), 9.2 (14.8), 14.1 (22.6) Clutch single dry disc operated by foot pedal Brakes multiple wet disc operated by two foot pedals which can be locked together Steering power assist Turning radius (on concrete surface with brake applied) right 114" (2.9 m) left 114" (2.9 m) (on concrete surface without brake) right 134" (3.4 m) left 134" (3.4 m) Turning space diameter (on concrete surface with brake applied) right 236" (6.0 m) left 236" (6.0 m) (on concrete surface without brake) right 276" (7.0 m) left 276" (7.0 m) Power take-off 540 rpm at 2243 engine rpm Unladen tractor mass 4240 lb (1923 kg).

TRACTOR SOUND LEVEL WITHOUT CAB	Front Wheel Drive	
	Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours	94.5	94.0
75% of Pull at Maximum Power—Ten Hours		93.5
50% of Pull at Maximum Power—Two Hours		92.5
50% of Pull at Reduced Engine Speed—Two Hours		88.5
Bystander in 8th (H4) gear		84.5

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Boiler hp (kW)	Cool- ing med	Air wet bulb	Air dry	Barom inHg (kPa)
50.15 (37.2)	2188 (9.73)	5.17 (8.32)	2500	5.87	2.266 (8.576)	0.524 (0.319)	15.31 (2.622)	185 (84.2)	40 (10.6)	51 (99.04)

Maximum Available Power—Two Hours 6th (H4) Gear

50.15 (37.2)	2188 (9.73)	5.17 (8.32)	2500	5.87	2.266 (8.576)	0.524 (0.319)	15.31 (2.622)	185 (84.2)	40 (10.6)	51 (99.04)
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MAXIMUM POWER IN SELECTED GEARS

25.80 (17.75)	4861 (21.62)	1.84 (2.95)	2560	14.94	3rd (L3) Gear	185 (83.0)	48 (8.9)	50 (10.0)	28.88 (97.52)
50.55 (37.27)	5049 (22.77)	3.76 (6.04)	2501	8.20	5th (H1) Gear	185 (84.2)	56 (2.2)	44 (6.7)	29.44 (99.41)
50.57 (37.29)	2218 (9.87)	5.17 (8.32)	2500	5.78	6th (H2) Gear	185 (84.2)	55 (1.7)	42 (5.6)	29.44 (99.41)

TIRES, BALLAST AND WEIGHT

Rear Tires	With Ballast		Without Ballast	
	No. size, ply & psi (kPa)	Weight (lb) (kg)	No. size, ply & psi (kPa)	Weight (lb) (kg)
Ballast	—Liquid (each)	172 lb (78 kg)	None	
	—Cast Iron (each)	260 lb (118 kg)	None	
Front Tires	With Ballast		Without Ballast	
	No. size, ply & psi (kPa)	Weight (lb) (kg)	No. size, ply & psi (kPa)	Weight (lb) (kg)
Ballast	—Liquid (each)	None	Two 9.5-16, 6, 32 (220)	None
	—Cast Iron (each)	552 lb (251 kg)	None	
Height of Drawbar	16 in (405 mm)		16 in (405 mm)	
Static Weight with Operator—Rear	5585 lb (2534 kg)		2720 lb (1234 kg)	
—Front	2560 lb (1161 kg)		1695 lb (769 kg)	
—Total	5945 lb (2697 kg)		4415 lb (2003 kg)	

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2525 (174.10)
Location	remote outlet
Hydraulic oil temperature °F (°C)	182 (83)
Location	suction pipe
	Maximum Lift Capacity
QUICK ATTACH	no
CATEGORY	1
LOAD lbs (kg)	2652 (1203)
TIME sec	1.95
HITCH POINT MOVEMENT in (mm)	
Lowest position	9.0 (229)
Top of timed range	51.1 (790)
Highest position	52.2 (818)
LOAD CG MOVEMENT in (mm)	
Lowest position	9.4 (239)
Top of timed range	55.1 (841)
Highest position	54.7 (881)

*Implement load capacity for transport purposes not specified by manufacturer

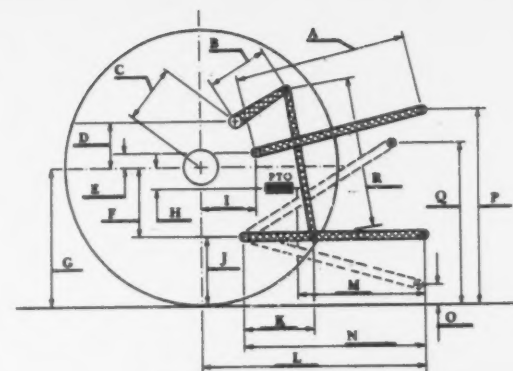
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 152°F (55.7°C). Four gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1555, June 12, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load



Kubota L3750 4WD Diesel

	inch	mm
A	23.6	600
B	9.5	240
C	11.6	294
D	11.0	279
E	10.6	269
F	7.1	180
G	23.3	593
H	0.5	13
I	11.9	301
J	16.3	413
K	14.6	370
L	35.2	894
M	20.3	517
N	31.1	790
O	8.0	203
P	34.3	870
Q	32.3	819
R	19.0	483

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omeredi, Dean and Director

NEBRASKA TRACTOR TEST 1556—KUBOTA L4150 4WD DIESEL ALSO KUBOTA L4150 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption				Temperature °F (°C)				Barometer in./h (kPa)
		gal/hr (L/h)	Bhp/hr (kW)	Hp/hr (kW)	Code medium	Air inlet bulb	Air wet bulb	Air dry bulb	Air inlet bulb	

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed — 626 rpm)										
40.64 (30.10)	2600	2.522 (9.48)	0.435 (0.26)	16.11 (11.74)	188 (86.7)	57 (14.1)	75 (23.8)	75 (23.8)	28.94 (97.7)	

Standard Power Take-off Speed (540 rpm) — One Hour										
40.22 (29.99)	2244	2.349 (8.89)	0.407 (0.248)	17.12 (12.73)	194 (89.0)	57 (14.1)	75 (23.8)	75 (23.8)	28.89 (97.58)	

VARYING POWER AND FUEL CONSUMPTION — Two Hours

35.37 (26.17)	2661	2.224 (8.419)	0.439 (0.267)	15.90 (11.33)	185 (83.9)	58 (14.4)	75 (23.9)	75 (23.9)		
0.00 (0.00)	2805	0.787 (2.980)	—	—	177 (80.3)	58 (14.2)	75 (23.6)	75 (23.6)		
18.06 (13.47)	2718	1.432 (5.422)	0.553 (0.336)	12.61 (9.13)	180 (82.2)	58 (14.2)	75 (23.9)	75 (23.9)		
41.46 (30.92)	2600	2.555 (9.673)	0.430 (0.261)	16.23 (11.97)	188 (86.7)	57 (14.4)	75 (23.9)	75 (23.9)		
9.18 (6.84)	2762	1.075 (4.071)	0.817 (0.497)	8.53 (6.18)	178 (81.1)	58 (14.4)	76 (24.2)	76 (24.2)		
26.85 (20.02)	2694	1.811 (6.855)	0.470 (0.286)	14.85 (10.92)	181 (82.8)	58 (14.4)	75 (23.9)	75 (23.9)		
Av (16.27)	2706	1.648 (6.237)	0.527 (0.320)	13.24 (9.609)	181 (82.8)	58 (14.4)	75 (23.9)	75 (23.9)	28.87 (97.58)	

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption				Temp °F (°C)				Barom in./h (kPa)
					gal/hr (L/h)	Bhp/hr (kW)	Hp/hr (kW)	Code medium	Air inlet bulb	Air wet bulb	Air dry bulb	Air inlet bulb	

Maximum Available Power — Two Hours 5th (H1) Gear

32.68 (24.12)	3101 (13.79)	3.95 (6.36)	2601	9.74 (9.417)	2.488 (9.121)	0.531 (0.321)	13.14 (9.58)	190 (87.8)	58 (14.4)	75 (22.5)	75 (26.95)		
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75% of Pull at Maximum Power — Ten Hours 5th (H1) Gear

27.21 (20.29)	2438 (10.84)	4.19 (6.74)	2678	7.21 (8.044)	2.125 (8.044)	0.545 (0.331)	12.81 (9.521)	181 (82.7)	55 (11.6)	40 (14.5)	29.09 (98.24)		
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50% of Pull at Maximum Power — Two Hours 5th (H1) Gear

18.81 (14.02)	1625 (7.23)	4.34 (6.98)	2708	4.84 (6.432)	1.699 (6.432)	0.630 (0.383)	11.07 (8.18)	181 (82.8)	54 (11.6)	35 (13.3)	28.93 (97.89)		
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50% of Pull at Reduced Engine Speed — Two Hours 6th (H2) Gear

18.81 (14.03)	1625 (7.23)	4.34 (6.99)	2020	4.84 (5.174)	1.420 (5.174)	0.526 (0.321)	13.25 (9.61)	181 (82.8)	35 (11.7)	40 (14.4)	28.91 (97.62)		
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MAXIMUM POWER IN SELECTED GEARS

22.58 (16.84)	4257 (18.93)	1.99 (3.20)	2693	14.77	3rd (L5) Gear	182 (83.3)	47 (8.3)	55 (12.8)	28.77 (97.15)		
32.54 (24.27)	4129 (18.36)	2.96 (4.76)	2601	14.89	4th (L4) Gear	185 (85.0)	49 (9.4)	57 (13.9)	28.77 (97.15)		
33.98 (25.14)	3217 (14.31)	3.96 (6.38)	2600	9.53	5th (H1) Gear	186 (85.6)	58 (14.4)	70 (21.2)	28.74 (97.08)		
34.50 (25.71)	2566 (10.52)	5.47 (8.80)	2599	6.84	6th (H2) Gear	186 (85.6)	55 (11.7)	61 (16.1)	28.75 (97.08)		
32.50 (24.21)	1516 (5.85)	9.26 (14.91)	2599	3.73	7th (H3) Gear	186 (85.3)	51 (10.6)	59 (15.0)	28.76 (97.12)		

Department of Agricultural Engineering

Dates of Test: March 22 to April 3, 1985

Manufacturer: KUBOTA, LTD., 2-47 Shikitsu-higashi 1-chome, Naniwa-ku, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8376 Fuel weight 6.974 lbs/gal (0.836 kg/l) Oil SAE 20W API service classification CC, CD, SE To motor 2.053 gal (7.696 l) Drained from motor 1.875 gal (7.097 l) Transmission and hydraulic lubricant Shell Donax TD or equivalent Front axle lubricant SAE 80/90 gear oil Total time engine was operated 45.5 hours.

ENGINE: Make Kubota Diesel Type five cylinder vertical Serial No. F2302-D1-DC-32717 Crankshaft lengthwise Rated rpm 2600 Bore and stroke 3.35" x 3.25" (85 mm x 82 mm) Compression ratio 18 to 1 Displacement 142 cu in (2326 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow cartridge Fuel filter one paper element Muffler underhood Exhaust vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. L4150DT-50827 Tread width rear 52" (1320 mm) to 76" (1930 mm) front 56" (1420 mm) Wheel base 76.4" (1940 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 30.2" (766 mm) Vertical distance above roadway 33.2" (844 mm) Horizontal distance from center of rear wheel tread 0.3" (7 mm) to the right Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.1 (1.7) second 1.4 (2.3) third 2.4 (3.8) fourth 3.6 (5.8) fifth 4.6 (7.4) sixth 6.1 (9.9) seventh 10.1 (16.2) eighth 15.4 (24.9) reverse 1.1 (1.7), 1.4 (2.3), 2.3 (3.8), 3.6 (5.8), 4.5 (7.3), 6.1 (9.8), 10.0 (16.1), 15.3 (24.7) Clutch single dry disc operated by foot pedal Brakes multiple wet disc operated by two foot pedals which can be locked together Steering power assist Turning radius (on concrete surface with brake applied) right 118" (3.0 m) left 118" (3.0 m) (on concrete surface without brake) right 138" (3.5 m) left 138" (3.5 m) Turning space diameter (on concrete surface with brake applied) right 254" (6.2 m) left 244" (6.2 m) (on concrete surface without brake) right 283" (7.2 m) left 283" (7.2 m) Power take-off 540 rpm at 2244 engine rpm Unladen tractor mass 4350 lb (1973 kg).

LUGGING ABILITY IN 5th (H1) GEAR

Crankshaft Speed rpm	2600	2327	2077	1821	1553	1308
Pull—lb (kN)	3217 (14.31)	3551 (15.80)	3799 (16.90)	3917 (17.42)	3949 (17.57)	3913 (17.41)
Increase in Pull %	0	10	18	22	23	22
Power—Hp (kW)	33.98 (25.14)	33.00 (24.61)	30.96 (23.06)	27.73 (20.69)	23.79 (17.74)	19.84 (14.80)
Speed—Mph (km/h)	3.96 (6.38)	3.49 (5.61)	3.06 (4.92)	2.66 (4.28)	2.26 (3.64)	1.90 (3.06)
Slip %	9.53	11.06	12.38	13.57	13.76	13.66

		Front Wheel Drive Engaged	
		Engaged dB(A)	Disengaged dB(A)
TRACTOR SOUND LEVEL WITHOUT CAB			
Maximum Available Power—Two Hours		94.0	93.5
75% of Pull at Maximum Power—Ten Hours			94.0
50% of Pull at Maximum Power—Two Hours			93.5
50% of Pull at Reduced Engine Speed—Two Hours			90.5
Battlerider in 8th (H4) gear			84.0

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption				Temp °F (°C)				Barom in./h (kPa)
					gal/hr (L/h)	Bhp/hr (kW)	Hp/hr (kW)	Code medium	Air inlet bulb	Air wet bulb	Air dry bulb	Air inlet bulb	

Maximum Available Power — Two Hours 5th (H1) Gear

32.70 (24.19)	2962 (13.17)	4.14 (6.66)	2600	7.41 (9.445)	2.195 (8.024)	0.532 (0.321)	13.11 (9.58)	192 (86.8)	58 (14.4)	74 (23.5)	28.66 (96.78)		
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MAXIMUM POWER IN SELECTED GEARS

27.68 (20.64)	5106 (22.98)	2.01 (3.23)	2668	15.00	3rd (L5) Gear	184 (84.2)	46 (7.8)	53 (11.7)	28.78 (97.16)		
33.85 (25.24)	3075 (13.67)	4.13 (6.65)	2599	7.61	5th (H1) Gear	186 (85.6)	57 (11.9)	67 (19.4)	28.74 (97.05)		
33.64 (25.09)	2224 (9.89)	5.67 (9.13)	2601	5.52	6th (H2) Gear	186 (85.6)	55 (12.8)	64 (17.8)	28.75 (97.08)		

Tires, Ballast and Weight	Roller Tires	Ballast	With Ballast	Without Ballast
Roller Tires	—No. size, ply & psi (kPa)	Two 14.9-28, 6, 14 (95)	Two 14.9-28, 6, 14 (95)	Two 14.9-28, 6, 14 (95)
Ballast	—Liquid (trach)	350 lb (159 kg)	350 lb (159 kg)	None
Front Tires	—No. size, ply & psi (kPa)	Two 9.5-20, 6, 32 (220)	Two 9.5-20, 6, 32 (220)	Two 9.5-20, 6, 32 (220)
Ballast	—Liquid (trach)	None	None	None
Height of Drawbar	—Cast Iron (trach)	192 lb (87 kg)	192 lb (87 kg)	None
Static Weight with Operator—Rear	—Front	4230 lb (1919 kg)	4230 lb (1919 kg)	2775 lb (1259 kg)
Static Weight with Operator—Front	—Total	2135 lb (968 kg)	2135 lb (968 kg)	1730 lb (784 kg)
Static Weight with Operator—Total	—Total	6365 lb (2887 kg)	6365 lb (2887 kg)	4505 lb (2053 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2475 (17060)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	193 (89)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	1	*not measured
LOAD lbs (kg)	2654 (1204)	
TIME sec	2.37	
HITCH POINT MOVEMENT in (mm)		
Lowest position	10.3 (262)	
Top of timed range	32.3 (820)	
Highest position	32.7 (831)	
LOAD CG MOVEMENT in (mm)		
Lowest position	9.8 (249)	
Top of timed range	33.6 (852)	
Highest position	34.3 (871)	

*Implement load capacity for transport purposes not specified by manufacturer.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

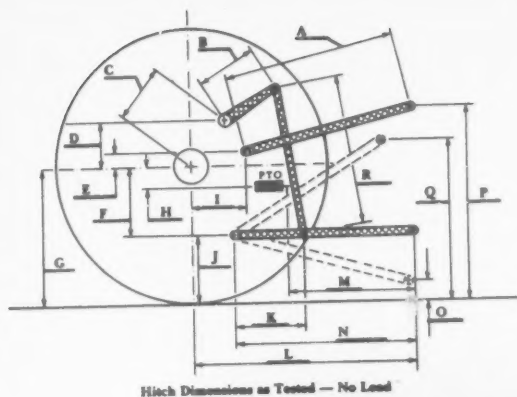
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 126°F (52°C). Five gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1556, June 14, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load



Kubota L4150 4WD Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

	inch	mm
A	25.3	591
B	9.5	240
C	11.6	294
D	11.0	279
E	10.6	269
F	7.1	180
G	24.3	617
H	0.5	13
I	11.9	301
J	17.2	437
K	14.6	370
L	35.2	894
M	20.5	517
N	31.1	790
O	8.0	203
P	35.3	895
Q	32.4	823
R	19.6	498

NEBRASKA TRACTOR TEST 1557—KUBOTA M8950DT DIESEL ALSO KUBOTA M8950 DIESEL

24 SPEED

POWER TAKE-OFF PERFORMANCE

Power Up (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	hp/hr/gal (kW/h)	Cooling medium	Temp. °F (°C)	Air dry bulb	Barom. in. Hg (kPa)
85.63 (63.83)	2400	5.282 (19.994)	0.430 (0.262)	16.21 (3.194)	101 (88.8)	56 (13.2)	75 (23.8)

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed — 1905 rpm)							
85.63 (63.83)	2400	5.282 (19.994)	0.430 (0.262)	16.21 (3.194)	101 (88.8)	56 (13.2)	75 (23.8)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

Power Up (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	hp/hr/gal (kW/h)	Cooling medium	Temp. °F (°C)	Air dry bulb	Barom. in. Hg (kPa)
74.22 (55.33)	2445	4.766 (18.062)	0.448 (0.272)	15.57 (3.068)	186 (85.8)	56 (13.3)	75 (23.8)
0.00 (0.00)	2552	1.570 (5.944)	—	—	179 (81.6)	55 (12.8)	75 (23.8)
58.03 (42.36)	2508	3.157 (11.952)	0.579 (0.352)	12.04 (2.372)	182 (83.3)	56 (13.3)	75 (23.9)
84.82 (63.25)	2401	5.287 (20.013)	0.435 (0.264)	16.04 (3.160)	192 (88.9)	57 (13.9)	77 (25.0)
19.17 (14.28)	2550	2.385 (9.021)	0.867 (0.527)	8.04 (1.505)	180 (82.2)	55 (12.8)	74 (23.3)
56.58 (42.04)	2479	3.949 (14.948)	0.489 (0.292)	14.26 (2.812)	183 (83.9)	56 (13.3)	76 (24.2)
45.43 (33.88)	2486	3.519 (13.338)	0.540 (0.339)	12.91 (2.544)	184 (84.2)	56 (13.2)	75 (23.9)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	hp/hr/gal (kW/h)	Cool- ing med.	Temp. °F (°C)	Air dry bulb	Barom. in. Hg (kPa)
Maximum Available Power — Two Hours 15th (B-4-L) Gear										
67.44 (50.29)	5561 (24.71)	4.55 (7.32)	2400	9.60 (7.32)	5.205 (19.701)	0.558 (0.322)	12.96 (2.553)	187 (85.8)	53 (11.6)	28.65 (10.75)
75% of Pull at Maximum Power — Ten Hours 15th (B-4-L) Gear										
55.06 (41.06)	4251 (18.91)	4.86 (7.82)	2471	6.52 (7.82)	4.449 (16.843)	0.564 (0.341)	12.57 (2.418)	185 (84.8)	42 (5.6)	28.39 (10.58)
50% of Pull at Maximum Power — Two Hours 15th (B-4-L) Gear										
38.04 (28.37)	2854 (12.81)	5.05 (8.10)	2595	4.24 (8.10)	3.671 (13.895)	0.675 (0.409)	10.56 (2.042)	185 (85.9)	59 (1.8)	28.56 (10.64)
50% of Pull at Reduced Engine Speed — Two Hours 19th (C-1-L) Gear										
38.04 (28.36)	2854 (12.80)	5.05 (8.10)	1583	4.13 (8.10)	2.638 (9.987)	0.484 (0.294)	14.42 (2.800)	185 (85.8)	39 (3.9)	28.55 (10.61)

MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	hp/hr/gal (kW/h)	Cool- ing med.	Temp. °F (°C)	Air dry bulb	Barom. in. Hg (kPa)
53.69 (40.03)	7974 (35.47)	2.52 (4.06)	2459	14.85 (4.06)	14.85 (56.25)	—	—	184 (84.4)	59 (1.9)	28.54 (10.38)
66.25 (49.40)	7855 (34.94)	3.16 (5.09)	2400	14.26 (5.09)	14.26 (54.16)	—	—	186 (85.3)	40 (4.6)	28.54 (10.56)
66.22 (49.38)	7526 (33.98)	3.39 (5.46)	2399	12.38 (5.46)	12.38 (46.53)	—	—	186 (85.3)	40 (4.6)	28.54 (10.56)
68.12 (50.79)	5712 (25.41)	4.47 (7.20)	2399	9.30 (7.20)	9.30 (35.13)	—	—	186 (85.3)	47 (8.3)	28.77 (10.75)
69.08 (51.31)	5668 (25.21)	4.57 (7.36)	2400	9.17 (7.36)	9.17 (34.83)	—	—	186 (85.3)	52 (11.2)	28.70 (10.62)
70.97 (52.92)	4907 (21.83)	5.42 (8.71)	2399	7.67 (8.71)	7.67 (28.83)	—	—	186 (85.3)	50 (10.0)	28.74 (10.71)
68.70 (51.23)	4076 (18.13)	6.32 (10.17)	2401	6.06 (10.17)	6.06 (22.83)	—	—	185 (85.0)	49 (9.4)	28.77 (10.73)
69.86 (52.10)	3523 (15.67)	7.44 (11.97)	2397	5.34 (11.97)	5.34 (20.00)	—	—	185 (85.0)	49 (9.4)	28.76 (10.72)
71.15 (51.04)	3541 (15.73)	7.55 (12.12)	2398	5.20 (12.12)	5.20 (19.68)	—	—	185 (85.0)	50 (10.0)	28.75 (10.68)
68.27 (50.91)	2628 (11.69)	9.74 (15.68)	2399	3.87 (15.68)	3.87 (14.58)	—	—	186 (85.3)	50 (10.0)	28.74 (10.68)

Department of Agricultural Engineering

Dates of Test: March 26 to April 8, 1985

Manufacturer: KUBOTA, LTD., 2-47 Shikusu-
gishashi, 1-chome, Naniwa-ku, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 48.3 (rating taken from oil company's
inspection data) Specific gravity converted to 60°
60°F (15/15°C) 0.8376 Fuel weight 6.974 lb/gal
(0.836 kg/l) Oil SAE 20W API service classifica-
tion CC, CD, SE To motor 5.427 gal (12.97 l)
Drained from motor 2.765 gal (10.467 l) Trans-
mission and hydraulic lubricant Shell Donax TD
or equivalent Front axle lubricant SAE 80/90 gear
oil Total time engine was operated 44.5 hours.

ENGINE: Make Kubota Diesel Type four cyl-
inder vertical with turbocharger Serial No. V4900-
TA-32599 Crankshaft lengthwise Rated rpm 2400
Bore and stroke 4.29" x 4.55" (109 mm x 115 mm)
Compression ratio 17 to 1 Displacement 262 cu
in (4292 ml) Starting system 12 volt Lubrication
pressure Air cleaner two paper elements Oil filter
one full flow cartridge Oil cooler engine coolant
heat exchanger for crankcase oil, radiator for
transmission and hydraulic oil Fuel filter one pa-
per cartridge Muffler vertical Cooling medium
temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No.
U50425 Tread width rear 59.8" (1520 mm) to 79.5"
(2020 mm) front 60.6" (1540 mm) to 68.5" (1740
mm) Wheel base 97.2" (2470 mm) Center of gravity
(without operator or ballast, with minimum tread,
with fuel tank filled and tractor serviced for op-
eration) Horizontal distance forward from center-
line of rear wheels 35.2" (895 mm) Vertical distance
above roadway 46.7" (1185 mm) Horizontal dis-
tance from center of rear wheel tread 0" (0 mm) to
the right/left Hydraulic control system direct en-
gine drive Transmission selective gear fixed ratio
with partial (2) range operator controlled power-
shift Advertised speeds mph (km/h) first 0.7 (1.1)
second 0.9 (1.4) third 0.9 (1.5) fourth 1.2 (1.9) fifth
1.2 (1.9) sixth 1.5 (2.3) seventh 1.6 (2.5) eighth 2.1
(3.4) ninth 2.1 (3.4) tenth 2.9 (4.6) eleventh 2.9
(4.7) twelfth 3.7 (5.9) thirteenth 3.9 (6.2) four-
teenth 4.9 (7.9) fifteenth 5.0 (8.1) sixteenth 5.9
(9.5) seventeenth 6.7 (10.8) eighteenth 7.9 (12.6)
nineteenth 8.0 (12.8) twentieth 10.1 (16.3) twenty-
first 10.6 (17.1) twenty-second 13.6 (21.8) twenty-
third 13.8 (22.3) twenty-fourth 18.5 (29.8) reverse
2.2 (3.3), 2.9 (4.7), 3.0 (4.8), 3.8 (6.1), 4.0 (6.4), 5.1
(8.2), 5.2 (8.3), 6.9 (11.1). Clutch single dry disc
operated by foot pedal Brakes multiple wet disc
hydraulically operated by two foot pedals which
can be locked together Steering hydrostatic Turn-
ing radius (on concrete surface with brake ap-

LUGGING ABILITY IN 15th (B-4-L) GEAR

Crankshaft Speed rpm	2400	2165	1915	1682	1440	1189
Pull—lbs (kN)	5668 (25.2)	6197 (27.5)	6786 (30.1)	7048 (31.3)	7244 (32.2)	7051 (31.1)
Increase in Pull %	0	9	20	24	28	24
Power—Hp (kW)	89.08 (65.5)	67.08 (50.0)	63.74 (47.5)	57.34 (42.9)	50.02 (37.3)	40.43 (30.1)
Speed—Mph (km/h)	4.57 (7.36)	4.06 (6.53)	3.52 (5.67)	3.06 (4.93)	2.59 (4.17)	2.15 (3.46)
Slip %	9.17	10.48	12.26	13.12	14.20	15.73

Front Wheel Drive
Engaged
dB(A)

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours	79.5	78.0
75% of Pull at Maximum Power—Ten Hours	79.5	79.0
50% of Pull at Maximum Power—Two Hours	79.0	75.5
50% of Pull at Reduced Engine Speed—Two Hours	75.5	86.5
Bystander in 24th (C-4-H) gear	86.5	

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Tractor fuel consumption gal/hr (l/hr)	Slip %	Fuel Consumption gal/hr (l/hr)	Temp. °F (°C)	Load lbs (kN)	Art dbs (kN)	Art dbs (kN)	Barren dbs (kN)
68.92 (51.39)	5432 (24.2)	4.74 (7.6)	24.00 (17.8)	6.65 (10.3)	5.219 (3.9)	13.20 (11.8)	187 (84.6)	54 (24.2)	67 (30.1)	28.57 (12.8)

Maximum Available Power—Two Hours 15th (B-4-L) Gear

68.92 (51.78)	5432 (24.25)	4.1 (7.6)	2400 (17.8)	6.65 (10.3)	5.219 (7.58)	0.328 (1.2)	1320 (2.60)	187 (86.1)	54 (24.9)	67 (30.2)	28.57 (12.8)
MAXIMUM POWER IN SELECTED GEARS											
52.12 (38.86)	10364 (46.16)	1.89 (3.0)	2465 (17.8)	14.73 (10.3)	9th (B-1-L) Gear			184 (84.6)	59 (26.8)	45 (20.4)	28.54 (12.8)
68.29 (50.93)	5514 (24.5)	4.64 (7.4)	2400 (17.8)	6.62 (10.3)	14th (B-5-H) Gear			186 (85.1)	48 (21.5)	58 (26.3)	28.77 (12.8)
70.35 (52.66)	5562 (24.7)	4.74 (7.6)	2400 (17.8)	6.54 (10.3)	15th (B-4-L) Gear			188 (86.6)	55 (24.9)	66 (29.8)	28.55 (12.8)
70.89 (52.66)	4748 (21.2)	5.60 (9.0)	2399 (17.7)	5.54 (8.9)	16th (C-1-L) Gear			186 (85.1)	51 (23.0)	62 (28.1)	28.73 (12.8)

TIRES, BALLAST AND WEIGHT

Row Tires	—No. size, ply & psi (kPa)	With Ballast	Without Ballast
Ballast	—Lugged (trach)	Two 15.4-54, 8, 16 (110)	Two 18.4-54, 8, 16 (110)
	—Case from (trach)	780 lb (354 kg)	None
Front Tires	—No. size, ply & psi (kPa)	Two 12.4-24, 8, 32 (220)	Two 12.4-24, 8, 32 (220)
Ballast	—Lugged (trach)	None	None
	—Case from (trach)	490 lb (222 kg)	None
Height of Drawbar		22 in (560 mm)	22 in (560 mm)
Static Weight with Operator—Rear		7820 lb (3547 kg)	6260 lb (2839 kg)
—Front		4450 lb (2018 kg)	5470 lb (2474 kg)
—Total		12270 lb (5565 kg)	11730 lb (5343 kg)

plied) right 146" (3.7 m) left 146" (3.7 m) (on concrete surface without brake) right 177" (4.5 m) left 177" (4.5 m) Turning space diameter (on concrete surface with brake applied) right 507" (7.8 m) left 507" (7.8 m) (on concrete surface without brake) right 570" (9.4 m) left 570" (9.4 m) Power take-off 540 rpm at 2035 engine rpm and 1005 rpm at 2400 engine rpm Unladen tractor mass 9555 lb (4334 kg).

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 149°F (64°C). Ten gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1557, June 12, 1985.

LOUIS I. LEVITICUS

Engineer-in-Charge

K. VON BARGEN

L. L. BASHFORD

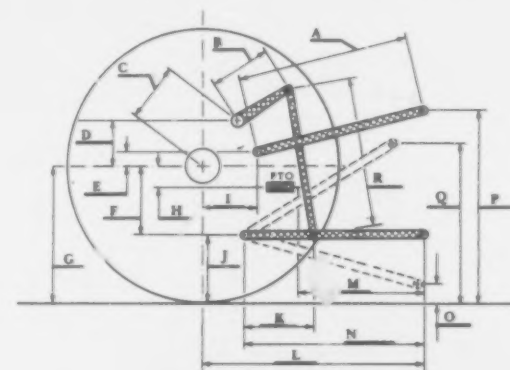
T. L. THOMPSON

Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2550 (17580)
Location	remote outlet
Hydraulic oil temperature °F (°C)	164 (71)
Location	filter inlet
Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	II
LOAD lbs (kg)	4478 (2071)
TIME sec	1.74
HITCH POINT MOVEMENT in (mm)	
Lowest position	15.2 (375)
Top of timed range	35.2 (894)
Highest position	** 36.1 (917)
LOAD CG MOVEMENT in (mm)	
Lowest position	12.9 (328)
Top of timed range	35.6 (904)
Highest position	36.6 (930)

*Implement load capacity for transport purposes not specified by manufacturer.
** The observed power range, 22.9 in (582 mm) is less than the minimum power range for Cat II, 24 in (610 mm) specified by ASAE Standard S217.10



Hitch Dimensions on Tests 1—No Load



Kubota M8950DT Diesel

	inch	mm
A	30.5	770
B	9.8	250
C	12.2	311
D	11.9	303
E	11.2	286
F	6.9	176
G	50.3	1270
H	0.8	21
I	10.8	273
J	23.4	594
K	20.9	530
L	40.0	1015
M	25.4	645
N	35.4	900
O	8.0	203
P	42.4	1077
Q	35.4	898
R	27.9	709

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1552—MASSEY FERGUSON 1020 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel consumption			Temperature °F (°C)				Barometer inches Hg (kPa)
		gal/hr (L/hr)	Bhp/hr (kW)	Hp/hr gal (kW/L)	Cooling medium	Air wet bulb	Air dry bulb	Air dry bulb	

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed—540 rpm)									
17.08 (12.73)	2355 (17.13)	1.377 (10.21)	0.562 (4.14)	12.40 (9.14)	202 (149)	57 (42)	75 (55)	28.81 (21.2)	

Standard Power Take-off Speed (540 rpm) — One Hour

16.24 (12.11)	2162 (16.07)	1.296 (9.67)	0.557 (4.10)	12.53 (9.18)	204 (150)	57 (42)	75 (55)	28.78 (21.1)	
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VARYING POWER AND FUEL CONSUMPTION — Two Hours

15.09 (11.25)	2343 (17.44)	1.174 (8.84)	0.543 (4.03)	12.85 (9.44)	188 (138)	57 (42)	75 (55)		
0.00 (0.00)	2539 (19.03)	0.413 (3.09)			161 (119)	56 (41)	76 (56)		
7.56 (5.64)	2453 (18.24)	0.736 (5.47)	0.679 (5.04)	10.27 (7.44)	186 (138)	56 (41)	75 (55)		
17.34 (12.93)	2350 (17.63)	1.420 (10.62)	0.571 (4.25)	12.22 (8.97)	200 (149)	56 (41)	75 (55)		
8.85 (6.57)	2500 (18.85)	0.585 (4.38)	1.039 (7.68)	6.59 (4.83)	161 (119)	56 (41)	75 (55)		
11.30 (8.43)	2441 (18.24)	0.921 (6.85)	0.568 (4.18)	12.28 (9.02)	168 (124)	57 (42)	75 (55)		
Av (8.83)	9.19 (6.83)	2454 (18.24)	0.875 (6.48)	0.664 (4.90)	10.51 (7.68)	174 (128)	56 (41)	75 (55)	20.77 (15.64)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel consumption			Temperature °F (°C)				Barometer inches Hg (kPa)
					gal/hr (L/hr)	Bhp/hr (kW)	Hp/hr gal (kW/L)	Cool- ing med- ium	Air wet bulb	Air dry bulb	Air dry bulb	

Maximum Available Power — Two Hours 11th (H2) Gear

14.53 (10.68)	1071 (7.76)	5.02 (3.75)	2350 (17.63)	7.87 (5.87)	1.383 (10.21)	0.675 (5.04)	10.36 (7.68)	185 (138)	60 (44)	61 (45)	20.84 (15.64)	
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75% of Pull at Maximum Power — Ten Hours 11th (H2) Gear

11.32 (8.44)	808 (5.98)	5.25 (3.91)	2425 (18.05)	6.44 (4.73)	1.084 (8.00)	0.668 (4.95)	10.44 (7.68)	159 (117)	48 (35)	61 (45)	20.05 (15.02)	
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50% of Pull at Maximum Power — Two Hours 11th (H2) Gear

7.92 (5.90)	545 (3.98)	5.45 (4.02)	2455 (18.24)	4.15 (3.07)	0.843 (6.21)	0.743 (5.52)	9.59 (7.02)	162 (119)	47 (35)	54 (39)	20.02 (15.00)	
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50% of Pull at Reduced Engine Speed — Two Hours 10th (H3) Gear

7.90 (5.89)	544 (3.97)	5.45 (4.02)	1666 (12.42)	4.07 (3.00)	0.705 (5.18)	0.622 (4.59)	11.22 (8.24)	168 (124)	50 (37)	60 (44)	20.99 (15.73)	
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MAXIMUM POWER IN SELECTED GEARS

13.94 (10.38)	1771 (12.88)	2.95 (2.20)	2392 (17.88)	13.00 (9.57)				9th (L3) Gear	176 (130)	50 (37)	62 (45)	20.92 (15.66)
14.00 (10.44)	1640 (12.00)	3.20 (2.37)	2349 (17.44)	14.54 (10.73)				10th (H1) Gear	187 (138)	50 (37)	62 (45)	20.89 (15.76)
14.59 (10.88)	1095 (8.06)	5.01 (3.75)	2350 (17.63)	8.08 (5.98)				11th (H2) Gear	185 (138)	50 (37)	62 (45)	20.86 (15.64)
14.45 (10.76)	715 (5.18)	7.58 (5.64)	2349 (17.63)	3.55 (2.60)				12th (H3) Gear	185 (138)	50 (37)	62 (45)	20.88 (15.72)

LUGGING ABILITY IN 11th (H2) GEAR

Crankshaft Speed rpm	2350	2115	1881	1648	1415	1177
Pull—lb (kN)	1095 (7.88)	1079 (7.80)	1114 (7.96)	1144 (8.20)	1107 (8.02)	997 (7.25)
Increase in Pull %	0	-1	2	5	1	-9
Power—Hp (kW)	14.59 (10.88)	12.95 (9.66)	11.85 (8.84)	10.67 (7.85)	8.88 (6.62)	6.72 (4.95)
Speed—Mph (km/h)	5.01 (3.75)	4.50 (3.38)	5.99 (4.44)	5.50 (4.03)	5.01 (3.75)	2.53 (1.89)
Slip %	8.08	8.08	8.41	8.49	8.16	7.24

Department of Agricultural Engineering

Date of Test: March 15 - 22, 1985

Manufacturer: TOYOSHA COMPANY, LTD., 55 Jonsho-16, Kadoma City, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60° 60°F (15/15°C) 0.8376 Fuel weight 6.974 lb/gal (0.876 kg/L) Oil SAE 30 API service classification SE, SF, CC. To motor 0.984 gal (3.726 L) Drained from motor 0.763 gal (2.889 L) Transmission and final drive lubricant Massey Ferguson Permatran III fluid Total time engine was operated 49.5 hours.

ENGINE: Make Toyosha Diesel Type three cylinder vertical Serial No. CS112M00858 Crankshaft lengthwise Rated rpm 2350 Bore and stroke 2.953" x 3.342" (75 mm x 85 mm) Compression ratio 23 to 1 Displacement 68.7 cu in (1126 ml) Starting system 12 volt Lubrication pressure Air cleaner one paper element Oil filter one full flow cartridge Fuel filter one paper element Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. 40586 Tread width rear 37.0" (940 mm) to 41.7" (1060 mm) from 38.0" (965 mm) Wheel base 56.7" (1440 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 26.0" (660 mm) Vertical distance above roadway 25.0" (635 mm) Horizontal distance from center of rear wheel tread 0.1" (2 mm) to the left Hydraulic control system direct engine drive Transmission selective gear: 2nd ratio Advertised speeds mph (km/h) first 0.7 (0.5) second 0.4 (0.3) third 0.6 (0.4) fourth 0.7 (0.5) fifth 1.0 (0.6) sixth 1.4 (0.9) seventh 2.0 (1.5) eighth 2.5 (1.8) ninth 3.5 (2.6) tenth 5.7 (4.3) eleventh 5.5 (4.1) twelfth 8.1 (6.1) reverse 0.6 (0.4) 1.4 (1.0) 3.4 (2.6) 7.9 (6.0) Clutch single dry disc operated by foot pedal Brakes drum and shoe operated by two foot pedals which can be locked together Steering mechanical Turning radius (on concrete surface with brake applied) right 89.0" (2.26 m) left 89.0" (2.26 m) on concrete surface without brake right 99.2" (2.52 m) left 99.2" (2.52 m) Turning space diameter (on concrete surface with brake applied) right 194" (4.92 m) left 194" (4.92 m) on concrete surface without brake right 214" (5.44 m) left 214" (5.44 m) Power take-off 540 rpm at 2162 engine rpm Unladen tractor mass 2050 lb (930 kg).

REPAIRS AND ADJUSTMENTS: The air filter was replaced during preliminary PTO tests.

TRACTOR SOUND LEVEL WITHOUT CAB	Front Wheel Drive	
	Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours	91.0	89.5
75% of Pull at Maximum Power—Ten Hours		89.5
50% of Pull at Maximum Power—Two Hours		89.0
50% of Pull at Reduced Engine Speed—Two Hours		87.5
Bystander in 12th (H3) gear		75.5

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel consumption			Temp °F (°C)				Barometer inches Hg (kPa)
					gal/hr (L/hr)	Bhp/hr (kW)	Hp/hr gal (kW/L)	Cool- ing med- ium	Air wet bulb	Air dry bulb	Air dry bulb	

Maximum Available Power — Two Hours 11th (H2) Gear

14.59 (10.88)	1035 (7.46)	5.19 (3.83)	2349 (17.63)	5.71 (4.25)	1.380 (10.21)	0.664 (4.95)	10.50 (7.68)	181 (138)	47 (35)	56 (41)	20.84 (15.64)	
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MAXIMUM POWER IN SELECTED GEARS

12.27 (9.15)	2257 (16.53)	2.94 (2.20)	2419 (17.91)	14.77 (10.88)				8th (L3) Gear	173 (128)	50 (37)	62 (45)	20.94 (15.73)
14.77 (10.88)	1068 (7.76)	5.19 (3.83)	2350 (17.63)	5.80 (4.25)				11th (H2) Gear	182 (138)	47 (35)	57 (42)	20.83 (15.64)

TIRES, BALLAST AND WEIGHT

Rear Tires	Ballast	With Ballast		Without Ballast	
		Two 6-14, 4, 22 (150)	Two 6-14, 4, 22 (150)	Two 6-14, 4, 22 (150)	Two 6-14, 4, 22 (150)
None	None	325 lb (148 kg)	None	None	None
From Tires	None	Two 6-14, 4, 22 (150)	Two 6-14, 4, 22 (150)	Two 6-14, 4, 22 (150)	Two 6-14, 4, 22 (150)
Ballast	None	None	None	None	None
Height of Drawbar	None	25 lb (11 kg)	None	None	None
Static Weight with Operator—Rear	None	1940 lb (880 kg)	1200 lb (545 kg)	1200 lb (545 kg)	1200 lb (545 kg)
	—Total	2950 lb (1329 kg)	2250 lb (1011 kg)	2250 lb (1011 kg)	2250 lb (1011 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2050 (141.30)	
Location	left cylinder	
Hydraulic oil temperature °F (°C)	154 (68)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	I	*not measured
LOAD lbs (kg)	1544 (700)	
TIME sec	30	
HITCH POINT MOVEMENT in (mm)		
Lowest position	8.0 (203)	
Top of timed range	30.1 (765)	
Highest position	50.5 (1280)	
LOAD CG MOVEMENT in (mm)		
Lowest position	8.6 (219)	
Top of timed range	50.6 (1280)	
Highest position	50.8 (1283)	

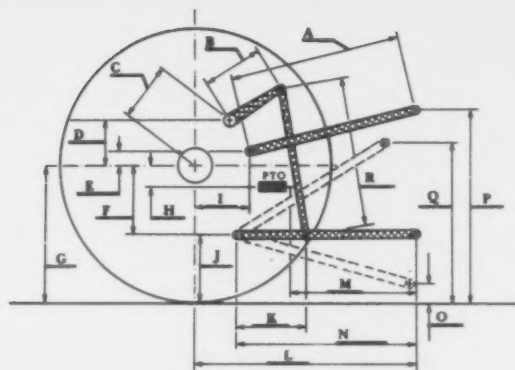
*Implement load capacity for transport purposes not specified by manufacturer.
**The observed highest position, 50.5 in (1280 mm) is less than the maximum height for highest position for Cat 1, 32 in (813 mm) specified by ASAE Standard S217.10.
The relief valve pressure was adjusted during the hitch test.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 140°F (60.1°C). Four gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1552, June 13, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	21.3	540
B	10.6	270
C	14.7	372
D	14.4	366
E	15.2	386
F	4.5	114
G	18.5	470
H	2.8	71
I	8.8	222
J	14.0	356
K	15.8	350
L	50.1	1264
M	20.4	518
N	25.6	650
O	6.3	159
P	52.0	1313
Q	50.3	1268
R	20.1	511



Massey Ferguson 1020 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Oenveit, Dean and Director

NEBRASKA TRACTOR TEST 1553—MASSEY FERGUSON 1030 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)		Barometer inches Hg (kPa)
		gal/hr (lit)	Bhp/hr (kW/h)	Cooling medium	Air wet bulb	Air dry bulb

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed — 540 rpm)						
25.55 (17.41)	2500 (6.904)	1.824 (0.331)	0.545 (0.322)	12.80 (90.3)	58 (14.3)	75 (23.8)
22.80 (17.00)	2327 (6.433)	1.758 (0.327)	0.558 (0.333)	12.97 (90.7)	58 (14.4)	75 (23.9)

Standard Power Take-off Speed (540 rpm) — One Hour						
22.80 (17.00)	2327 (6.433)	1.758 (0.327)	0.558 (0.333)	12.97 (90.7)	58 (14.4)	75 (23.9)

VARYING POWER AND FUEL CONSUMPTION — Two Hours						
20.54 (15.32)	2587 (6.151)	1.626 (0.316)	0.532 (0.324)	12.63 (94.2)	58 (14.4)	75 (23.9)

0.00 (0.00)	2676 (2.345)	0.619 (0.345)	—	—	166 (74.2)	58 (14.4)
10.40 (7.73)	2622 (6.022)	1.065 (0.434)	0.715 (0.428)	9.79 (57.0)	167 (75.0)	58 (14.4)

25.49 (17.51)	2501 (6.931)	1.857 (0.332)	0.545 (0.319)	12.79 (89.7)	194 (14.4)	58 (23.9)
5.24 (3.91)	2645 (3.175)	0.859 (0.679)	1.116 (1.211)	6.25 (1.211)	166 (74.4)	58 (23.9)

15.44 (11.31)	2595 (4.914)	1.505 (0.358)	0.509 (0.334)	11.85 (76.6)	170 (14.4)	58 (23.9)
18.52 (9.33)	2604 (4.597)	1.215 (0.412)	0.677 (0.388)	10.31 (79.8)	174 (14.6)	58 (23.8)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)		Barom. inches Hg (kPa)
					gal/hr (lit)	Bhp/hr (kW/h)	Cool- ing medium	Air wet bulb	

Maximum Available Power — Two Hours 10th (H1) Gear									
18.29 (13.84)	1202 (5.35)	5.71 (9.18)	2501 (6.899)	7.55 (0.422)	1.821 (0.999)	10.04 (88.3)	191 (13.3)	60 (21.4)	28.61 (96.36)

75% of Pull at Maximum Power — Two Hours 10th (H1) Gear									
14.68 (10.94)	920 (4.09)	5.98 (9.63)	2570 (6.936)	5.47 (0.432)	1.494 (0.833)	9.82 (1.933)	1:0 (78.3)	48 (9.1)	28.54 (96.36)

50% of Pull at Maximum Power — Two Hours 10th (H2) Gear									
10.06 (7.50)	614 (2.73)	6.14 (9.88)	2594 (6.988)	5.89 (0.401)	1.311 (0.738)	8.30 (1.838)	168 (73.3)	46 (7.8)	28.44 (96.04)

50% of Pull at Reduced Engine Speed — Two Hours 11th (H3) Gear									
10.05 (7.48)	615 (2.73)	6.14 (9.88)	1821 (5.088)	5.74 (0.401)	0.948 (0.509)	10.59 (2.089)	167 (73.0)	49 (9.4)	28.49 (96.19)

MAXIMUM POWER IN SELECTED GEARS

Power—Hp (kW)	Crankshaft speed rpm	Drawbar pull lb (kN)	Speed mph (km/h)	Slip %	Fuel Consumption		Temp. °F (°C)		Barom. inches Hg (kPa)
					gal/hr (lit)	Bhp/hr (kW/h)	Cool- ing medium	Air wet bulb	

17.44 (13.01)	2277 (10.13)	2.87 (4.62)	2497 (10.13)	14.63 (4.62)	8th (M4) Gear	180 (76.1)	45 (7.2)	47 (8.3)	28.60 (95.90)
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18.30 (13.63)	1781 (7.92)	5.85 (8.20)	2501 (6.20)	11.74 (6.20)	9th (H1) Gear	190 (87.3)	58 (14.4)	69 (20.6)	28.64 (96.71)
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18.66 (13.91)	1227 (5.46)	5.70 (9.18)	2502 (6.918)	7.45 (9.18)	10th (H2) Gear	189 (86.9)	58 (14.4)	69 (20.6)	28.64 (96.71)
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17.51 (13.04)	788 (3.31)	8.35 (13.41)	2501 (6.918)	4.78 (13.41)	11th (H3) Gear	191 (88.1)	61 (16.1)	73 (22.8)	28.62 (96.63)
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LUGGING ABILITY IN 10th (H2) GEAR

Crankshaft Speed rpm									
2502	2247	1994	1755	1498	1245				

1227 (5.46)	1227 (5.46)	1350 (5.92)	1584 (6.18)	1449 (6.45)	1485 (6.61)	1470 (6.54)			
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Power—Hp (kW)									
18.66 (13.91)	18.66 (13.91)	18.01 (13.43)	16.55 (12.33)	15.14 (11.29)	13.24 (9.80)	10.88 (8.11)			

Speed—Mph (km/h)									
5.70 (9.18)	5.70 (9.18)	5.08 (8.17)	4.48 (7.21)	3.92 (6.31)	3.54 (5.38)	2.78 (4.47)			

Slip %									
7.45	8.14	8.86	9.60	9.40	9.51				

Department of Agricultural Engineering

Dates of Test: March 18 - 28, 1985

Manufacturer: TOYOSHA COMPANY, LTD. 55
Joshi-16, Kadoma City, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 48.3 (rating taken from oil company's
inspection data) Specific gravity converted to 60/
60°F (15/15°C) 0.8376 Fuel weight 6.974 lb/gal
(0.836 kg/l) Oil SAE 30 API service classification
SE, SF, CC To motor 0.956 gal (3.619 l) Drained
from motor 0.777 gal (2.943 l) Transmission and
final drive lubricant Massey Ferguson Permatran
III fluid Total time engine was operated 49.5
hours.

ENGINE: Make Toyosha Diesel Type three cyl-
inder vertical Serial No. MS142M00758 Crank-
shaft lengthwise Rated rpm 2500 Bore and stroke
3.228" x 3.543" (82 mm x 90 mm) Compression
ratio 23 to 1 Displacement 87 cu in (1425 ml)
Starting system 12 volt Lubrication pressure Air
cleaner two paper elements Oil filter one full flow
cartridge Oil cooler radiator for power steering
fluid Fuel filter one paper element Muffler vertical
Cooling medium temperature control one
thermostat.

CHASSIS: Type front wheel assist Serial No.
40584 Trend width rear 41.1" (1045 mm) to 62.6"
(1590 mm) front 38.0" (965 mm) Wheel base 61.4"
(1560 mm) Center of gravity (without operator or
ballast, with minimum tread, with fuel tank filled
and tractor serviced for operation) Horizontal dis-
tance forward from center-line of rear wheels 23.2"
(590 mm) Vertical distance above roadway 25.7"
(653 mm) Horizontal distance from center of rear
wheel tread 0.5" (7 mm) to the left Hydraulic con-
trol system direct engine drive Transmission se-
lective gear fixed ratio Advertised speeds mph
(km/h) first 0.4 (0.6) second 0.6 (0.9) third 0.7 (1.2)
fourth 1.0 (1.7) fifth 1.2 (2.0) sixth 1.7 (2.8) sev-
enth 2.5 (4.0) eighth 3.4 (5.4) ninth 4.3 (7.0) tenth
6.2 (9.9) eleventh 8.7 (14.0) twelfth 11.9 (19.2)
reverse 0.7 (1.1), 2.4 (3.9), 8.4 (13.5) Clutch single
dry disc operated by foot pedal Brakes wet disc
operated by two foot pedals that can be locked
together Steering power assist Turning radius (on
concrete surface with brake applied) right 94.1"
(2.39 m) left 94.1" (2.39 m) (on concrete surface
without brake) right 105.1" (2.67 m) left 105.1"
(2.67 m) Turning space diameter (on concrete sur-
face with brake applied) right 204.2" (5.19 m) left
204.2" (5.19 m) (on concrete surface without brake)
right 226.2" (5.73 m) left 226.2" (5.73 m) Power
take-off 540 rpm at 2327 engine rpm Unladen
tractor mass 2815 lb (1277 kg).

TRACTOR SOUND LEVEL WITHOUT CAB	Front Wheel Drive	
	Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours	92.0	91.0
75% of Pull at Maximum Power—Ten Hours		90.5
50% of Pull at Maximum Power—Two Hours		88.0
50% of Pull at Reduced Engine Speed—Two Hours		86.5
Standards at 120h (H3) gear		77.0

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crack shaft rpm	Sig %	Fuel Consumption gal/hr (l/h)	Temp °F (°C)	Barom. inches Hg (kPa)
					gal/hr (l/h)	Oil temp °F (°C)	
					hp to gal (kW to l/h)	Air wet bulb °F (°C)	
						Air dry bulb °F (°C)	
Maximum Available Power—Two Hours 10th (H2) Gear							
18.02	1144	5.91	2500	5.22	1.814	0.702	9.95
(13.44)	(5.06)	(4.51)			(0.686)	(0.427)	(1.957)
							(14.7)
MAXIMUM POWER IN SELECTED GEARS							
16.35	2829	2.17	2541	14.79	7th (M5) Gear	169	45
(12.17)	(12.56)	(3.46)				(56.1)	(6.1)
18.49	1704	4.07	2501	7.96	9th (H1) Gear	188	58
(13.76)	(7.56)	(4.51)				(68.4)	(14.6)
18.31	1165	5.90	2499	5.24	10th (H2) Gear	188	58
(13.45)	(5.17)	(4.51)				(68.4)	(14.6)

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Base Tires	No. size ply & psi (kPa)	Two 11.2-24, 8, 18 (121)	Two 11.2-24, 8, 18 (121)
Ballast	—Liquid (crack)	None	None
	—Cast Iron (crack)	342 lb (155 kg)	None
Front Tires	No. size ply & psi (kPa)	Two 6-14, 8, 28 (195)	Two 6-14, 8, 28 (195)
Ballast	—Liquid (crack)	None	None
	—Cast Iron (crack)	120 lb (55 kg)	None
Height of Drawbar		18 in (151 mm)	18 in (151 mm)
Static Weight with Operator—Rear		2810 lb (1274 kg)	1925 lb (877 kg)
	—Front	1505 lb (682 kg)	1065 lb (483 kg)
	—Total	4315 lb (1956 kg)	2990 lb (1354 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2025 (139.6)	
Location	left cylinder	
Hydraulic oil temperature °F (°C)	134 (57)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	1	*not measured
LOAD lb (kg)	1734 (787)	
TIME sec	1.75	
HITCH POINT MOVEMENT in (mm)		
Lowest position	10.6 (268)	
Top of timed range	31.6 (802)	
Highest position	** 51.7 (1314)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.4 (290)	
Top of timed range	28.2 (716)	
Highest position	28.5 (728)	

*Implement load capacity for transport purposes not specified by manufacturer

**The observed power range 21.1 to 13.6 mm is less than the minimum power range for Cat 1, 22 to 159 mm specified by ASAE Standard S217.10

**The observed highest position 51.7 to 804 mm is less than the minimum height for highest position for Cat 1, 52 to 413 mm specified by ASAE Standard S217.10

REPAIRS AND ADJUSTMENTS: The throttle lever friction disc was tightened during the preliminary PTO tests.

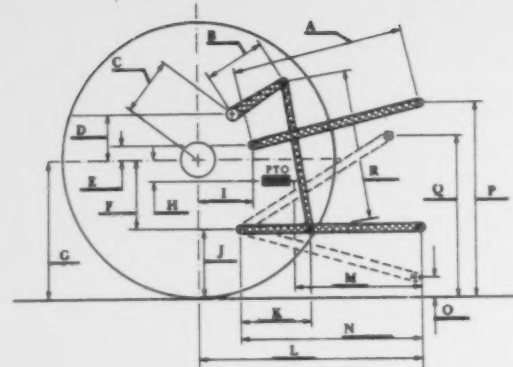
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 137°F (58.4°C). Four gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1553, June 13, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

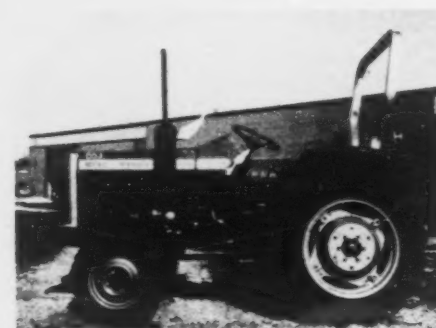
K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	23.9	606
B	10.6	270
C	15.5	393
D	15.2	386
E	16.1	409
F	5.3	135
G	20.6	522
H	1.8	46
I	8.1	206
J	15.3	387
K	15.4	390
L	32.2	819
M	21.8	554
N	25.6	650
O	7.8	197
P	33.5	845
Q	30.8	781
R	25.0	635



Massey Ferguson 1030 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omevdi, Dean and Director

NEBRASKA TRACTOR TEST 1554—MASSEY FERGUSON 1040 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)			Barometer each Hg (kPa)
		gal/hr (L/hr)	Bhp, hp (kW)	Air dry bulb	Cooling medium	Air wet bulb	
MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed — Two hours (FTO Speed—578 rpm)							
27.75 (20.68)	2500	2.164 (8.193)	0.544 (0.131)	12.81 (2.524)	186 (75)	58 (14.3)	28.94 (97.73)

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed—578 rpm)							
27.75 (20.68)	2500	2.164 (8.193)	0.544 (0.131)	12.81 (2.524)	58 (85.7)	75 (23.9)	28.94 (97.73)
Standard Power Take-off Speed (540 rpm) — One Hour							
25.80 (19.24)	2354	1.987 (7.522)	0.537 (0.122)	12.98 (2.557)	184 (84.5)	57 (13.8)	28.92 (97.66)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

24.47 (18.25)	2596	2.005 (7.588)	0.571 (0.147)	12.21 (2.485)	180 (82.2)	57 (13.6)	28.92 (97.66)
0.00 (0.00)	2680	0.779 (2.947)	—	—	167 (74.7)	57 (13.6)	28.92 (97.66)
12.47 (9.30)	2643	1.358 (5.084)	0.748 (0.455)	9.32 (1.836)	170 (76.4)	57 (13.9)	28.92 (97.66)
28.27 (21.08)	2502	2.168 (8.207)	0.555 (0.125)	13.04 (2.549)	185 (85.0)	56 (13.3)	28.92 (97.66)
6.26 (4.67)	2655	1.058 (4.006)	1.178 (0.717)	5.92 (1.166)	168 (75.3)	56 (13.3)	28.92 (97.66)
18.48 (13.75)	2615	1.659 (6.204)	0.618 (0.176)	11.28 (2.221)	171 (77.2)	57 (13.6)	28.92 (97.66)
As (11.18)	14.99 (11.18)	1.499 (5.649)	0.697 (0.424)	10.81 (2.192)	173 (78.3)	56 (13.4)	28.91 (97.62)

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (L/hr)	Temp. °F (°C)	Barom. in. Hg (kPa)		
					gal/hr (L/hr) <td>Air dry bulb</td> <td></td>	Air dry bulb			
					gal/hr (L/hr) <td>Air wet bulb</td> <td></td>	Air wet bulb			
Maximum Available Power — Two Hours 10th (H2) Gear									
21.80 (16.23)	1485 (6.60)	5.51 (8.87)	2500 (9.27)	6.63 (1.96)	0.693 (0.421)	10.07 (1.983)	45 (10.6)	28.72 (96.97)	
75% of Pull at Maximum Power — Ten Hours 10th (H2) Gear									
17.95 (13.39)	1150 (5.12)	5.85 (9.42)	2614 (9.42)	5.50 (1.32)	0.942 (0.443)	9.53 (1.877)	45 (11.2)	28.77 (97.13)	
50% of Pull at Maximum Power — Two Hours 10th (H2) Gear									
12.26 (9.14)	768 (3.41)	5.99 (9.64)	2640 (9.64)	3.95 (1.94)	1.563 (0.541)	7.84 (17.6)	38 (10.1)	43 (98.22)	29.09
50% of Pull at Reduced Engine Speed — Two Hours 11th (H3) Gear									
12.25 (9.14)	767 (3.41)	5.99 (9.63)	1855 (6.83)	3.79 (1.46)	1.217 (0.422)	0.695 (1.983)	10.06 (17.6)	44 (11.4)	29.05

MAXIMUM POWER IN SELECTED GEARS

21.17 (15.79)	2795 (12.43)	2.84 (4.37)	2575 (9.57)	14.68 (4.37)	8th (H4) Gear	174 (78.6)	48 (8.9)	60 (15.6)	28.96 (97.79)
22.32 (16.84)	2235 (9.91)	3.75 (6.03)	2501 (9.27)	10.42 (3.01)	9th (H1) Gear	173 (78.1)	44 (8.7)	49 (9.9)	28.74 (97.03)
22.57 (16.83)	1535 (8.82)	5.52 (8.89)	2502 (9.27)	6.53 (1.83)	10th (H2) Gear	173 (78.1)	45 (8.9)	48 (9.7)	28.76 (97.12)
21.45 (15.98)	1002 (4.46)	8.02 (12.91)	2500 (9.27)	4.53 (12.91)	11th (H3) Gear	173 (78.1)	44 (8.7)	50 (10.0)	28.73 (97.02)

LUGGING ABILITY IN 10th (H2) GEAR

Crankshaft Speed rpm	2502	2241	2001	1755	1506	1247	998
Pull—lb (kN)	1533 (6.82)	1534 (6.82)	1614 (7.18)	1866 (8.30)	2041 (9.08)	2100 (9.34)	1978 (8.86)
Increase in Pull %	0	0	5	22	33	37	29
Power—Hp (kW)	22.57 (16.83)	20.25 (15.08)	18.94 (14.12)	18.95 (14.13)	17.59 (13.12)	14.90 (11.11)	11.52 (8.44)
Speed—Mph (km/h)	5.52 (8.89)	4.94 (7.94)	4.40 (7.08)	3.81 (6.13)	3.25 (5.20)	2.66 (4.28)	2.15 (3.43)
Slip %	6.53	6.63	6.84	8.14	9.22	9.70	9.03

Department of Agricultural Engineering

Dates of Test: March 14 - 26, 1985

Manufacturer: TOYOSHA COMPANY, LTD. 55
Joshi-16, Kadoma City, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 48.3 (rating taken from oil company's
inspection data) Specific gravity converted to 60/
60°F (15/15°C) 0.8376 Fuel weight 6.974 lb/gal
(0.836 kg/l) Oil SAE 30 API service classification
SE, SF, CC To motor 0.971 gal (3.673 l) Drained
from motor 0.919 gal (3.480 l) Transmission and
final drive lubricant Massey Ferguson Permatran
III fluid Total time engine was operated 41.0
hours.

ENGINE: Make Toyosha Diesel Type three cyl-
inder vertical Serial No. 35200255 Crankshaft
lengthwise Rated rpm 2500 Bore and stroke 5.622"
x 5.937" (92 mm x 100 mm) Compression ratio
23 to 1 Displacement 121.7 cu in (1994 ml) Start-
ing system 12 volt Lubrication pressure Air cleaner
one paper element Oil filter one full flow car-
tridge Fuel filter one paper cartridge and sedi-
ment bowl Muffler vertical Cooling medium
temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No.
40298 Tread width rear 45.3" (1150 mm) to 63.6"
(1615 mm) front 47.2" (1200 mm) Wheel base 68.9"
(1750 mm) Center of gravity (without operator or
ballast, with minimum tread, with fuel tank filled
and tractor serviced for operation) Horizontal dis-
tance forward from center-line of rear wheels 30.6"
(777 mm) Vertical distance above roadway 28.1"
(715 mm) Horizontal distance from center of rear
wheel tread 0.1" (2 mm) to the left Hydraulic con-
trol system direct engine drive Transmission sel-
ective gear fixed ratio Advertised speeds mph
(km/h) first 0.4 (0.6) second 0.5 (0.8) third 0.7 (1.2)
fourth 1.0 (1.6) fifth 1.2 (1.9) sixth 1.7 (2.7) sev-
enth 2.4 (3.8) eighth 3.3 (5.3) ninth 4.2 (6.8) tenth
6.0 (9.6) eleventh 8.5 (13.6) twelfth 11.6 (18.6)
reverse 0.7 (1.1), 2.3 (3.7), 8.2 (13.2) Clutch single
dry disc operated by foot pedal Brakes multiple
wet disc operated by two foot pedals which can be
locked together Steering power assist Turning ra-
dius (on concrete surface with brake applied) right
112" (2.84 m) left 112" (2.84 m) (on concrete surface
without brake) right 125" (3.18 m) left 125" (3.18
m) Turning space diameter (on concrete surface
with brake applied) right 232" (5.89 m) left 232"
(5.89 m) (on concrete surface without brake) right
258" (6.53 m) left 258" (6.53 m) Power take-off 540
rpm at 2334 engine rpm Unladen tractor mass
3620 lb (1642 kg).

REPAIRS AND ADJUSTMENTS: No repairs
or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	Front Wheel Drive Engaged dB(A)	Disengaged dB(A)
Maximum Available Power—Two Hours	88.5	88.0
75% of Pull at Maximum Power—Ten Hours	—	90.0
50% of Pull at Maximum Power—Two Hours	—	89.5
50% of Pull at Reduced Engine Speed—Two Hours	—	88.0
Bystander in 12th (H4) gear	—	78.5

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (L/hr)	Temp. °F (°C)	Barom. in. Hg (kPa)		
					gal/hr (L/hr)	Temp. °F (°C)			
Maximum Available Power — Two Hours 10th (H2) Gear									
20.91 (15.39)	1364 (6.07)	5.75 (9.25)	2500 (9.25)	4.94 (1.36)	2.165 (8.194)	0.722 (0.190)	173 (78.3)	45 (11.2)	28.70 (96.90)
MAXIMUM POWER IN SELECTED GEARS									
19.93 (14.86)	3501 (15.37)	2.13 (3.44)	2585 (9.44)	14.78 (4.37)	7th (M3) Gear	173 (78.3)	47 (8.3)	58 (14.4)	29.01 (97.96)
22.11 (16.49)	2090 (9.29)	3.97 (6.39)	2501 (9.27)	7.48 (2.13)	9th (H1) Gear	172 (77.8)	44 (8.7)	49 (9.4)	28.74 (97.03)
21.65 (16.13)	1413 (6.29)	5.75 (9.25)	2501 (9.27)	4.94 (1.36)	10th (H2) Gear	173 (78.3)	45 (8.9)	48 (9.7)	28.77 (97.13)

TIRES, BALLAST AND WEIGHT	With Ballast	Without Ballast
Rear Tires	—No. size, ply & psi (kPa)	Two 15.5-24, 4, 14 (1.95)
Ballast	—Liquid (mch)	None
	—Cast iron (mch)	635 lb (288 kg)
Front Tires	—No. size, ply & psi (kPa)	Two 8-16, 4, 22 (1.90)
Ballast	—Liquid (mch)	None
	—Cast iron (mch)	22 lb (10 kg)
Height of Drawbar	15 in (380 mm)	15 in (380 mm)
Basic Weight with Operator—Rear	5080 lb (2280 kg)	3190 lb (1440 kg)
	—Front	1655 lb (750 kg)
	—Total	4715 lb (2139 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	1875 (12930)	
Location	lift cylinder	
Hydraulic oil temperature °F (°C)	145 (63)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	I	*not measured
LOAD lb (kg)	1734 (787)	
TIME sec	1.88	
HITCH POINT MOVEMENT in (mm)		
Lowest position	11.0 (279)	
Top of timed range	32.0 (813)	
Highest position	32.0 (813)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.9 (302)	
Top of timed range	30.3 (770)	
Highest position	30.9 (784)	

*Implement load capacity for transport purposes not specified by manufacturer.
*The observed power range, 21 to (134 mm) is less than the minimum power range for Cat 1, 22 in (559 mm)
specified by ASAE Standard S217.10.

REMARKS: All test results were determined
from observed data obtained in accordance with
SAE and ASAE test codes and the technically
equivalent ISO test codes or official Nebraska test
procedure. For the maximum power tests, the fuel
temperature at the injection pump was maintained
at 146°F (63.3°C). Four gears were chosen between
15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true
and correct report of official Tractor Test No. 1554.
June 13, 1985.

LOUIS I. LEVITICUS

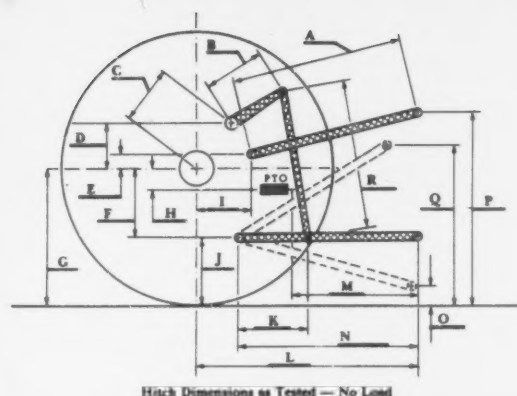
Engineer-in-Charge

K. VON BARGEN

L. L. BASHFORD

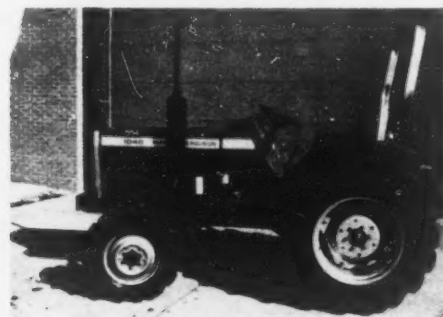
T. L. THOMPSON

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	19.5	495
B	10.6	270
C	15.5	393
D	15.2	386
E	16.1	409
F	5.3	135
G	21.7	551
H	1.8	47
I	12.3	312
J	16.4	417
K	15.4	390
L	32.2	819
M	21.8	554
N	25.6	650
O	8.0	203
P	34.4	874
Q	30.8	782
R	25.0	635



Massey Ferguson 1040 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omsvedi, Dean and Director

NEBRASKA TRACTOR TEST 1542—STEIGER BEARCAT IV KM-225 DIESEL 20 SPEED

DRAWBAR PERFORMANCE AT 2100 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	Temp. °F (°C)	Barom. in. Hg (kPa)
Maximum Available Power — Two Hours 10th (3B) Gear							
188.03 (140.21)	13209 (58.59)	5.54 (8.95)	2098 (163.22)	3.41 (0.238)	11.444 (43.321)	16.43 (83.9)	28.51 (19.26)
75% of Pull at Maximum Power — Ten Hours 10th (3B) Gear							
152.15 (113.46)	10106 (44.95)	5.65 (9.09)	2198 (170.99)	2.34 (0.278)	9.956 (37.688)	15.28 (83.8)	28.45 (19.08)
50% of Pull at Maximum Power — Two Hours 10th (3B) Gear							
105.08 (76.87)	6692 (29.77)	5.78 (9.30)	2236 (174.49)	1.88 (0.321)	7.859 (29.749)	13.12 (73.84)	28.47 (19.14)
50% of Pull at Reduced Engine Speed — Two Hours 14th (4B) Gear							
105.34 (77.08)	6690 (29.76)	5.79 (9.32)	1557 (120.8)	1.92 (0.268)	6.525 (24.706)	15.84 (88.4)	28.60 (19.56)

MAXIMUM POWER IN SELECTED GEARS

170.97 (127.49)	31556 (140.37)	2.05 (3.27)	2125 (165.8)	14.82 (1.2)	5rd (1C) Gear	182 (83.3)	40 (4.4)	44 (6.7)	28.81 (19.29)
180.36 (134.49)	28154 (125.23)	2.40 (3.87)	2100 (162.6)	9.49 (0.8)	4th (1D) Gear	182 (83.3)	42 (4.6)	46 (7.8)	28.81 (19.29)
186.35 (138.98)	24759 (110.13)	2.82 (4.54)	2099 (163.1)	7.14 (0.6)	3th (2A) Gear	182 (83.3)	45 (4.9)	49 (8.2)	28.81 (19.29)
189.56 (141.36)	22143 (98.50)	3.21 (5.17)	2098 (163.0)	6.22 (0.5)	2th (2B) Gear	183 (83.6)	49 (5.4)	53 (9.1)	28.82 (19.32)
190.71 (142.22)	19529 (86.87)	5.66 (9.09)	2100 (163.2)	5.21 (0.4)	7th (2C) Gear	183 (83.6)	50 (5.4)	54 (9.2)	28.83 (19.33)
195.11 (144.00)	17318 (77.03)	4.18 (6.71)	2099 (163.1)	4.02 (0.3)	8th (2D) Gear	184 (84.2)	44 (4.8)	50 (8.6)	28.83 (19.33)
192.82 (143.78)	15289 (68.01)	4.75 (7.61)	2099 (163.1)	5.53 (0.4)	9th (3A) Gear	183 (83.6)	44 (4.8)	50 (8.6)	28.89 (19.36)
192.52 (143.41)	15474 (69.94)	5.35 (8.61)	2100 (163.2)	3.04 (0.2)	10th (3B) Gear	183 (83.6)	45 (4.9)	50 (8.6)	28.95 (19.39)
191.18 (142.56)	11828 (52.61)	6.06 (9.75)	2098 (163.1)	2.71 (0.2)	11th (3C) Gear	183 (83.6)	44 (4.8)	50 (8.6)	28.88 (19.32)
187.82 (140.06)	10276 (45.71)	6.85 (11.0)	2100 (163.2)	2.30 (0.2)	12th (3D) Gear	183 (83.6)	44 (4.8)	51 (8.7)	28.87 (19.31)
187.62 (139.91)	8859 (39.41)	7.94 (12.78)	2101 (163.3)	1.68 (0.1)	13th (4A) Gear	183 (83.6)	45 (4.9)	51 (8.7)	28.85 (19.30)
183.86 (137.10)	7684 (34.18)	8.97 (14.44)	2101 (163.3)	1.62 (0.1)	14th (4B) Gear	182 (83.3)	45 (4.9)	51 (8.7)	28.84 (19.30)

LUGGING ABILITY IN 10th (3B) GEAR

Crankshaft Speed rpm	2100	1887	1680	1464	1246	1047
Pull—lb (kN)	13474 (59.96)	15945 (70.93)	17949 (79.84)	19665 (87.47)	20253 (90.09)	18741 (83.36)
Increase in Pull %	0	18	35	46	50	59
Power—Hp (kW)	192.52 (143.41)	205.34 (151.63)	202.67 (151.13)	192.54 (143.58)	168.38 (125.56)	151.47 (111.01)
Speed—Mph (km/h)	5.55 (8.91)	4.78 (7.70)	4.23 (6.81)	3.67 (5.91)	3.12 (5.02)	2.63 (4.23)
Slip %	3.04	3.62	4.26	4.74	5.06	4.58

TRACTOR SOUND LEVEL WITH CAB	1700 RPM dB(A)	1900 RPM dB(A)	2100 RPM dB(A)
Maximum Available Power—Two Hours	81.0	79.5	79.0
75% of Pull at Maximum Power—Ten Hours			80.5
50% of Pull at Maximum Power—Two Hours			80.0
50% of Pull at Reduced Engine Speed—Two Hours			77.0
Bystander in 18th (5B) gear			101.5

Department of Agricultural Engineering

Dates of Test: October 10 to 23, 1984

Manufacturer: STEIGER TRACTOR, INC., 406
Main Avenue, Fargo, North Dakota 58126

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 46.8 (raja taken from oil company's
inspection data) Specific gravity converted to 60/
60°F (15/15°C) 0.8375 Fuel weight 6.973 lbs/gal
(0.836 kg/l) Oil SAE 10W-30 API service clas-
sification SE-SF, CC-CD To motor 7.122 gal
(26.96 l) Drained from motor 6.158 gal (23.236 l)
Transmission and hydraulic lubricant SAE 10
hydraulic oil Final drive lubricant SAE 80W-90
Total time engine was operated 48.5 hours.

ENGINE: Make Cummins Diesel Type six cyl-
inder vertical with turbocharger Serial No.
34505469 Crankshaft lengthwise Rated rpm 1700
to 2100 Bore and stroke 4.921" x 5.354" (125 mm
x 136 mm) Compression ratio 16.0 to 1 Dis-
placement 611 cu in (10014 ml) Starting system
12 volt Lubrication pressure Air cleaner two pa-
per elements and aspirator Oil filter one full flow
cartridge and one bypass cartridge Oil cooler en-
gine coolant heat exchanger for crankcase oil, ra-
diator for hydraulic oil, radiator for transmission
and transfer case oil Fuel filter one paper car-
tridge Muffler none Cooling medium tempera-
ture control one thermostat.

CHASSIS: Type four wheel drive with duals
Serial No. 112-05847 Tread width rear 79" (2007
mm) to 136.5" (3462 mm) front 79" (2007 mm) to
136.5" (3462 mm) Wheel base 129" (3277 mm)
Center of gravity (without operator or ballast, with
minimum tread, with fuel tank filled and tractor
serviced for operation) Horizontal distance for-
ward from center-line of rear wheels 74.4" (1890
mm) Vertical distance above roadway 45.5" (1156
mm) Horizontal distance from center of rear wheel
tread 0" (0 mm) to the right/left Hydraulic control
system direct engine drive Transmission selective
gear fixed ratio Advertised speeds mph (km/h)
first 1.8 (2.9) second 2.0 (3.2) third 2.3 (3.7) fourth
2.6 (4.2) fifth 2.9 (4.7) sixth 3.3 (5.3) seventh 3.7
(6.0) eighth 4.2 (6.8) ninth 4.7 (7.6) tenth 5.4 (8.7)
eleventh 6.0 (9.7) twelfth 6.8 (10.9) thirteenth 7.8
(12.6) fourteenth 8.9 (14.3) fifteenth 10.0 (16.1)
sixteenth 11.3 (18.2) seventeenth 12.5 (20.1) eight-
eenth 14.2 (22.9) nineteenth 15.8 (25.4) twentieth
18.0 (29.0) reverse 1.8 (2.9), 2.0 (3.2), 2.3 (3.7), 2.6
(4.2) Clutch dual dry disc hydraulically actuated
by foot pedal Brakes single caliper disc hydro-
lically actuated by foot pedal Steering hydrostatic
and articulated Turning radius (on concrete sur-
face without brake) right 283" (7.19 m) left 288"
(7.32 m) Turning space diameter (on concrete
surface without brake) right 590" (14.99 m) left
600" (15.24 m) Power take-off none Unladen
tractor mass 28220 lb (12801 kg).

DRAWBAR PERFORMANCE AT 1900 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Temp. °F (°C)	Code med	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)	
Maximum Available Power — Two Hours 10th (3B) Gear											
291.87 (217.65)	17087 (48.01)	6.09 (9.79)	1899	4.30	17.596 (65.830)	0.415 (0.215)	16.78 (5.305)	184 (84.2)	64 (17.5)	71 (21.4)	29.03 (98.03)
MAXIMUM POWER IN SELECTED GEARS											
247.51 (184.42)	12507 (144.60)	2.85 (4.59)	2085	14.71	8th (1D) Gear		180	42	46	28.50 (96.24)	
259.80 (193.73)	12237 (143.40)	3.02 (4.86)	1902	13.96	5th (2A) Gear		180	42	45	28.48 (96.17)	
277.51 (206.94)	28968 (128.85)	3.58 (5.78)	1901	9.03	6th (2B) Gear		182	61	65	28.97 (97.83)	
280.75 (209.34)	25161 (111.92)	4.18 (6.71)	1904	6.87	7th (2C) Gear		182	62	67	28.97 (97.83)	
286.10 (213.34)	22532 (100.23)	4.76 (7.66)	1901	5.81	8th (2D) Gear		183	63	70	28.96 (97.79)	
291.07 (217.05)	20505 (90.31)	5.38 (8.65)	1902	4.81	9th (3A) Gear		183	64	71	28.97 (97.83)	
299.50 (223.19)	18426 (81.96)	6.09 (9.80)	1901	4.54	10th (3B) Gear		184	65	73	28.99 (97.89)	
296.85 (221.36)	15973 (71.07)	6.97 (11.22)	1900	5.63	11th (3C) Gear		185	64	72	28.98 (97.86)	
296.58 (221.16)	14071 (62.59)	7.90 (12.72)	1902	5.07	12th (3D) Gear		184	64	72	28.98 (97.86)	
295.86 (219.13)	12109 (53.86)	9.10 (14.65)	1900	2.58	13th (4A) Gear		185	64	72	28.97 (97.83)	

DRAWBAR PERFORMANCE AT 1700 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Temp. °F (°C)	Code med	Air wet bulb	Air dry bulb	Barom. inches Hg (kPa)	
Maximum Available Power — Two Hours 10th (3B) Gear											
289.58 (215.94)	20122 (89.51)	5.40 (8.68)	1700	5.28	16.757 (63.434)	0.404 (0.245)	17.28 (5.604)	182 (83.3)	45 (7.2)	51 (10.6)	28.59 (96.54)
MAXIMUM POWER IN SELECTED GEARS											
265.45 (196.44)	12700 (143.64)	3.02 (4.86)	1697	14.54	6th (2B) Gear			182 (83.1)	45 (6.1)	47 (8.3)	28.52 (96.31)
274.21 (204.48)	28016 (124.62)	3.67 (5.91)	1702	8.77	7th (2C) Gear			182 (83.3)	62 (16.7)	68 (20.0)	28.98 (97.79)
282.41 (210.59)	25169 (111.96)	4.21 (6.77)	1701	7.02	8th (2D) Gear			184 (84.2)	64 (17.8)	72 (22.2)	28.98 (97.79)
290.89 (216.92)	22950 (102.00)	4.76 (7.66)	1700	5.97	9th (3A) Gear			185 (84.7)	64 (17.8)	71 (21.7)	28.97 (97.83)
298.04 (222.25)	20673 (91.96)	5.41 (8.70)	1700	5.12	10th (3B) Gear			185 (85.0)	65 (18.3)	73 (22.8)	28.98 (97.86)
296.55 (221.14)	17952 (79.77)	6.20 (9.98)	1701	4.26	11th (3C) Gear			185 (84.7)	64 (17.8)	72 (22.2)	28.98 (97.86)
298.41 (222.52)	15899 (70.72)	7.04 (11.33)	1701	5.63	12th (3D) Gear			185 (84.7)	64 (17.8)	72 (22.2)	28.98 (97.86)
297.52 (221.71)	15742 (61.13)	8.11 (12.98)	1701	2.99	13th (4A) Gear			185 (85.0)	64 (17.8)	71 (21.7)	28.97 (97.83)

TIRES, BALLAST AND WEIGHT

Same Tires	With Ballast	Without Ballast
—No. Size, ply & psi (kPa)	Four 25.1-54, 8, inner	Four 25.1-54, 8, inner
	14 (95) outer (2 (85)	14 (95) outer (2 (85)
Ballast	—Liquid (each inner)	None
	—Cast Iron (each)	None
Front Tires	—No. Size, ply & psi (kPa)	Four 25.1-54, 8, inner
		14 (95) outer (2 (85)
Ballast	—Liquid (each inner)	None
	—Cast Iron (each)	None
Height of Drawbar	18 in. (457 mm)	18 in. (457 mm)
Static Weight with Operator—Rear	16515 lb. (6993 kg)	11800 lb. (5352 kg)
—Front	19600 lb. (8900 kg)	17980 lb. (8147 kg)
—Total	35715 lb. (15293 kg)	29780 lb. (13499 kg)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ANSA test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 122°F (50°C). Ten gears were chosen between 15% slip and 10 mph (16.1 km/h). The engine oil pressure gauge did not function properly during drawbar tests.

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1543, December 3, 1984.

LOUIS I. LEVITICUS

Engineer-in-Charge

K. VON BARGEN

W. E. SPLINTER

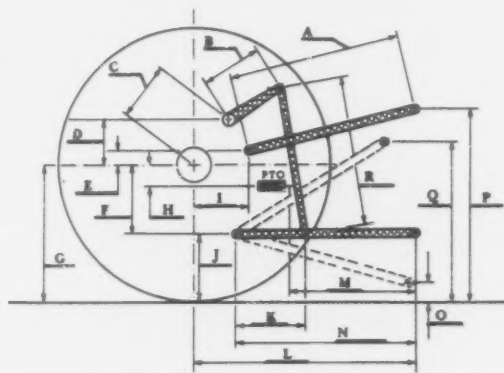
L. L. BASHFORD

Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2500	1586 ^a
Location	remote	
Hydraulic oil temperature °F (°C)	129	54
Location	hydraulic reservoir	
Maximum Lift Capacity		
yes		
no		
Category	III	*not measured
LOAD lbs (kg)	12752	5784
TIME sec	5.47	
HITCH POINT MOVEMENT in (mm)		
Lowest position	14.9	378
Top of timed range	40.9	1038
Highest position	41.4	1051
LOAD CG MOVEMENT in (mm)		
Lowest position	14.5	368
Top of timed range	45.4	1102
Highest position	44.0	1118

*Implement load capacity for transport purposes not specified by manufacturer.



Hitch Dimensions as Tested — No Limit

	inch	mm
A	31.4	797
B	15.0	381
C	26.8	681
D	22.5	566
E	5.7	145
F	13.5	343
G	32.1	816
H	NA	NA
I	18.1	460
J	18.6	473
K	15.0	381
L	50.1	1273
L'	56.6	1438
M	NA	NA
N	32.0	813
O	8.0	203
P	40.6	1032
Q	35.8	908
R	34.5	876

L' to end of quick attach



Steiger Bearcat IV KM-225 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1577—STEIGER COUGAR CR 1225 DIESEL 20 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hps (kW)	Crank- shaft speed rpm	Fuel Consumption		Temperature °F (°C)		Barometer in. Hg (kPa)		
		gal/hr (L/hr)	Hp-hr/gal (kg/kWh)	Hp-hr/gal (kg/kWh)	Cooling medium			
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed—999 rpm)								
208.61 (155.56)	2100	12.675 (47.980)	0.426 (0.279)	16.46 (1.242)	179 (81.7)	62 (16.6)	75 (23.9)	29.06 (9.12)
VARYING POWER AND FUEL CONSUMPTION — Two Hours								
180.56 (134.49)	2155	11.574 (43.084)	0.442 (0.289)	15.86 (1.24)	179 (81.7)	66 (18.6)	75 (23.9)	
0.00 (0.00)	2250	5.550 (20.83)			175 (78.4)	65 (18.3)	75 (22.6)	
92.97 (68.32)	2202	7.548 (28.573)	0.569 (0.366)	12.32 (2.426)	176 (80.6)	65 (18.3)	74 (23.1)	
210.22 (156.76)	2100	12.754 (48.206)	0.425 (0.278)	16.51 (1.252)	180 (81.9)	66 (18.6)	74 (23.1)	
66.86 (49.42)	2225	5.627 (21.300)	0.842 (0.512)	8.33 (1.640)	176 (79.7)	67 (19.2)	75 (23.6)	
157.56 (110.43)	2169	9.444 (35.748)	0.482 (0.293)	14.35 (2.865)	178 (81.1)	68 (19.7)	76 (24.2)	
Av. (42.99)	2100	8.576 (31.767)	0.528 (0.321)	13.29 (2.617)	177 (80.6)	66 (18.6)	74 (23.4)	29.02 (9.16)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)		Barom. in. Hg (kPa)	
					gal/hr (L/hr)	hp-hr/gal (kg/kWh)	Cool- ing med. water	Air dry bulb		
Maximum Available Power — Two Hours 10th (5LL) Gear										
181.59 (135.26)	15186 (6.65)	5.16 (8.30)	2101	5.06	12.594 (47.675)	0.487 (0.296)	14.40 (2.857)	182 (83.3)	58 (16.6)	28.84 (9.16)
75% of Pull at Maximum Power — Ten Hours 10th (5LL) Gear										
145.07 (106.68)	10085 (44.85)	5.32 (8.56)	2147	2.14	10.630 (40.24)	0.521 (0.317)	13.46 (2.451)	180 (82.2)	54 (12.2)	28.94 (9.71)
50% of Pull at Maximum Power — Two Hours 10th (5LL) Gear										
97.78 (72.92)	6722 (29.90)	5.45 (8.78)	2185	1.45	8.344 (32.34)	0.615 (0.373)	11.44 (2.255)	178 (81.1)	55 (16.6)	28.87 (9.71)
50% of Pull at Reduced Engine Speed — Two Hours 15th (2HL) Gear										
97.98 (73.06)	6720 (29.89)	5.47 (8.80)	1211	1.35	6.454 (24.412)	0.602 (0.281)	13.18 (2.400)	178 (81.1)	58 (16.6)	28.73 (9.70)
MAXIMUM POWER IN SELECTED GEARS										
147.16 (109.76)	29570 (132.53)	1.87 (3.00)	2125	14.96	2nd (1LL) Gear		179 (81.7)	45 (12.2)	49 (14.9)	28.74 (9.6)
178.21 (132.89)	25887 (116.26)	2.80 (4.50)	2102	6.56	3rd (2LL) Gear		179 (81.7)	48 (14.9)	51 (15.6)	28.82 (9.73)
180.08 (134.28)	21552 (96.89)	3.17 (5.08)	2101	5.57	4th (3LL) Gear		180 (82.2)	49 (14.9)	52 (15.6)	28.82 (9.73)
180.79 (134.62)	19826 (88.19)	5.42 (8.71)	2100	5.11	5th (2LL) Gear		180 (82.2)	49 (14.9)	52 (15.6)	28.82 (9.73)
181.86 (135.61)	17706 (79.76)	5.85 (9.20)	2099	4.55	6th (3LL) Gear		181 (82.2)	49 (14.9)	53 (15.6)	28.82 (9.73)
182.22 (135.88)	17541 (77.13)	5.94 (9.34)	2099	4.55	7th (4LL) Gear		181 (82.2)	49 (14.9)	53 (15.6)	28.83 (9.73)
185.50 (136.83)	14812 (65.89)	4.65 (7.48)	2100	3.58	8th (16LL) Gear		181 (82.2)	50 (14.9)	54 (12.2)	28.83 (9.73)
181.64 (135.45)	14222 (63.26)	4.78 (7.71)	2101	5.14	9th (4LL) Gear		181 (82.2)	50 (14.9)	54 (12.2)	28.83 (9.73)
184.85 (137.81)	15444 (69.80)	5.16 (8.30)	2100	5.06	10th (3LL) Gear		181 (82.2)	50 (14.9)	54 (12.2)	28.84 (9.73)
182.52 (136.10)	12161 (54.98)	5.65 (9.06)	2100	2.73	11th (16HL) Gear		181 (82.2)	50 (14.9)	57 (13.8)	28.84 (9.73)
178.64 (133.21)	10737 (47.76)	6.24 (10.06)	2099	2.24	12th (3LL) Gear		181 (82.2)	50 (14.9)	56 (13.8)	28.84 (9.73)
181.46 (133.12)	8666 (38.11)	7.85 (12.61)	2099	1.73	15th (2HL) Gear		181 (82.2)	50 (14.9)	55 (12.8)	28.84 (9.73)
180.16 (134.83)	7670 (34.12)	8.81 (14.18)	2099	1.06	14th (3HL) Gear		181 (82.2)	50 (14.9)	55 (12.8)	28.85 (9.73)

Department of Agricultural Engineering

Dates of Test: September 23 to 30, 1985

Manufacturer: STEIGER TRACTOR INC. 406
Main Avenue, Fargo, North Dakota 58126

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 46.9 (rating taken from oil company's
inspection data) Specific gravity converted to 60/
60°F (15/15°C) 0.8420 Fuel weight 7.01 lb/gal
(0.890 kg/L) Oil SAE 15W-40 API service classi-
fication CD, SE, CC. To motor 5.895 gal (22.108 L)
Drained from motor 5.257 gal (19.823 L) Trans-
mission and final drive lubricant Steiger hydrau-
lic/transmission fluid Total time engine was
operated 54.0 hours.

ENGINE: Make Caterpillar Diesel Type six cyl-
inder vertical with turbocharger Serial No.
64205886 Crankshaft lengthwise Rated rpm 2100
Bore and stroke 4.75" x 6.00" (120.7 mm x 152.4
mm) Compression ratio 15.0 to 1 Displacement
658 cu in (10.655 m³) Starting system 12 volt Low
lubrication pressure Air cleaner two paper elements
and aspirator Oil filter one full flow cartridge Oil
cooler engine coolant heat exchanger for crank-
case oil, radiator for hydraulic oil, radiator for
transmission oil Fuel filter one paper cartridge
and prestrainer Mufflers vertical Cooling medium
temperature control one thermostat

CHASSIS: Type four wheel drive with duals
Serial No. C01-05359 Tread width rear 64" (1625
mm) to 130" (3302 mm) front 64" (1625 mm) to 130"
(3302 mm) Wheel base 130" (3302 mm) Center of
gravity (without operator or ballast, with mini-
mum tread, with fuel tank filled and tractor
secured for operation) Horizontal distance forward
from center-line of rear wheels 72.0" (1829 mm)
Vertical distance above roadway 46.0" (1168 mm)
Horizontal distance from center of rear wheel tread
0" (0 mm) to the right-left Hydraulic control sys-
tem direct engine drive Transmission selective gear
fixed ratio with partial (2) range operator con-
trolled powershift Advertised speeds mph (km/h)
first 1.8 (2.9) second 2.1 (3.4) third 2.9 (4.7) fourth
3.5 (5.3) fifth 5.5 (8.8) sixth 5.9 (9.3) seventh 4.0
(6.4) eighth 4.7 (7.6) ninth 4.8 (7.7) tenth 5.2 (8.4)
eleventh 5.6 (9.0) twelfth 6.2 (10.0) thirteenth 7.8
(12.6) fourteenth 8.7 (14.0) fifteenth 9.4 (15.1) six-
teenth 10.5 (16.9) seventeenth 10.7 (17.2) eight-
eenth 12.9 (20.8) nineteenth 13.8 (22.2) twentieth
16.6 (26.7) reverse 3.2 (5.2), 3.9 (6.3), 8.7 (14.0),
10.4 (16.8) Clutch wet multiple disc hydraulically
power actuated and operated by foot pedal Brakes
caliper disc hydraulically operated by foot pedal
Steering hydrostatic and articulated Turning ra-
dian (on concrete surface without brake) right 240°
(6.1 m) left 240° (6.1 m) Turning space diameter
(on concrete surface without brake) right 499"
(12.67 m) left 499" (12.67 m) Power take-off 999
rpm at 2100 engine rpm Unladen tractor mass
26050 lb (11816 kg).

LUGGING ABILITY IN 10th (5LL) GEAR

Crankshaft Speed (rpm)	2100	1800	1685	1470	1260	1047
Pull—lb	15444	16082	17108	17924	18044	17790
(kN)	(59.80)	(71.54)	(76.40)	(79.71)	(80.26)	(79.11)
Increase in Pull %	0	20	27	33	54	32
Power—Hp	184.83	197.32	186.58	170.00	146.37	120.40
(kW)	(137.85)	(147.26)	(139.14)	(126.77)	(109.50)	(89.78)
Speed—Mph	5.16	4.61	4.09	3.36	3.05	2.54
(km/h)	(8.30)	(7.41)	(6.56)	(5.42)	(4.90)	(4.08)
Slip %	3.06	3.86	4.02	4.17	4.53	4.17

TRACTOR SOUND LEVEL WITH CAB

dB(A)

Maximum Available Power—Two Hours	78.0
75% of Pull at Maximum Power—Ten Hours	79.0
50% of Pull at Maximum Power—Two Hours	78.0
50% of Pull at Reduced Engine Speed—Two Hours	75.0
Restraider in 20th (5HH) gear	90.0

TIRES, BALLAST AND WEIGHT

Rear Tires	—No. size ply & psi (kPa)	Towed Without Ballast
Ballast	—Liquid (water)	Four 23.1-54, 8, inner
	—Case (iron track)	14.405 (outer 12.05)
		None
Front Tires	—No. size ply & psi (kPa)	Four 23.1-54, 8, inner
Ballast	—Liquid (water)	14.405 (outer 12.05)
	—Case (iron track)	None
Height of Obstacle		14.5 in. (370 mm)
Static Weight with Operator	—Rear	(2965 lb) (1345 kg)
	—Front	(1623 lb) (736 kg)
	—Total	(29190 lb) (13240 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2100 (17240)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	121 (49)	
Location	hydraulic reservoir	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	yes	
CATEGORY	III	*not measured
LOAD lbs (kg)	9930 (4504)	
TIME sec	2.64	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.0 (305)	
Top of timed range	38.0 (965)	
Highest position	40.3 (1024)	
LOAD CG MOVEMENT in (mm)		
Lowest position	12.2 (310)	
Top of timed range	39.3 (998)	
Highest position	42.4 (1077)	

*Impeller lift capacity for transport purposes not specified by manufacturer

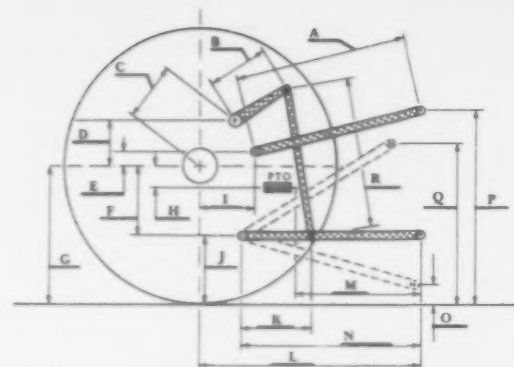
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 156°F (68.8°C). Thirteen gears were chosen between 15th slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1577, October 30, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
T. L. THOMPSON
L. L. BASHFORD
Board of Tractor Test Engineers



Hitch Dimensions as Towed — No Load

	inch	mm
A	29.4	746
B	21.0	533
C	25.8	654
D	25.1	638
E	11.4	289
F	9.9	251
G	32.3	819
H	2.2	56
I	23.3	591
J	22.4	568
K	23.0	584
L	32.7	838
M	57.7	1465
N	25.0	635
O	42.0	1067
P	7.9	201
Q	44.4	1127
R	40.4	1026
S	35.3	895

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Steiger Cougar CR 1225 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omeretti, Dean and Director

NEBRASKA TRACTOR TEST 1578—STEIGER COUGAR CR 1280 DIESEL 20 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)			Barometer in. Hg (kPa)
		gal/hr (L/hr)	Hp/hr gal (kg/4.5 L)	Hp/hr gal (L/hr)	Cooling medium	wet bulb	Air dry bulb (°F)
MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed—Two hours (PTO Speed—999 rpm)							
258.15 (192.51)	2100	15.021 (56.862)	0.408 (0.248)	17.19 (3.185)	179 (81.8)	63 (17.1)	28.84 (97.32)

VARYING POWER AND FUEL CONSUMPTION—Two Hours

223.90 (166.96)	2142	13.485 (51.048)	0.422 (0.257)	16.60 (3.271)	179 (81.7)	64 (17.5)	75 (23.6)
0.180 (0.10)	2228	8.726 (33.206)	0.329 (0.202)	15.25 (2.808)	177 (80.3)	63 (17.2)	74 (23.5)
115.84 (86.78)	2220	8.745 (33.01)	0.329 (0.202)	15.25 (2.808)	178 (81.1)	64 (17.8)	75 (23.6)
257.95 (192.15)	2100	14.987 (56.734)	0.407 (0.248)	17.21 (3.194)	180 (81.9)	67 (19.2)	77 (25.0)
58.87 (43.90)	2253	6.525 (24.912)	0.753 (0.458)	9.51 (1.816)	177 (80.6)	65 (18.1)	75 (23.6)
171.08 (127.57)	2183	11.102 (42.027)	0.455 (0.277)	15.41 (3.035)	178 (81.1)	67 (19.2)	76 (24.4)
Av 157.94 As 102.86	2196	9.728 (36.826)	0.495 (0.301)	14.18 (2.793)	178 (81.1)	65 (18.2)	75 (23.6)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Temp °F (°C)	Barometer in. Hg (kPa)
Maximum Available Power—Two Hours 10th (5LL) Gear					
225.22 (167.95)	16251 (72.29)	5.20 (8.36)	2100	5.84 (3.24)	14.859 (0.281)

75% of Pull at Maximum Power—Ten Hours 10th (5LL) Gear

180.58 (134.66)	12517 (55.68)	5.41 (8.71)	2165	2.74 (0.15)	12.627 (0.240)
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50% of Pull at Maximum Power—Two Hours 10th (5LL) Gear

124.10 (92.54)	8545 (37.12)	5.38 (8.67)	2208	3.91 (0.21)	10.040 (0.145)
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50% of Pull at Reduced Engine Speed—Two Hours 15th (2HH) Gear

124.14 (92.57)	8545 (37.12)	5.38 (8.68)	1221	3.74 (0.195)	8.214 (0.262)
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MAXIMUM POWER IN SELECTED GEARS

199.08 (149.45)	28708 (127.56)	2.60 (4.18)	2110	14.84 (0.18)	3rd (2LL) Gear	184 (89.2)	46 (13.3)	29.08 (98.20)
216.62 (161.53)	26013 (115.71)	3.12 (5.01)	2100	8.23 (0.15)	4th (3LL) Gear	184 (89.2)	46 (13.3)	29.07 (98.17)
221.01 (164.81)	24519 (108.17)	3.41 (5.46)	2099	6.89 (0.15)	5th (21H) Gear	185 (83.9)	60 (17.6)	28.75 (97.02)
224.15 (167.15)	21758 (96.78)	3.86 (6.22)	2100	5.66 (0.15)	6th (3LLH) Gear	185 (83.9)	60 (17.6)	28.73 (97.02)
225.40 (166.59)	21195 (94.28)	3.95 (6.36)	2099	5.43 (0.15)	7th (4LL) Gear	182 (83.3)	60 (17.6)	28.73 (97.02)
226.75 (169.09)	18194 (80.93)	4.67 (7.52)	2098	4.32 (0.15)	8th (1HL) Gear	182 (83.3)	60 (17.6)	28.73 (97.02)
226.54 (168.78)	17595 (78.26)	4.82 (7.76)	2102	4.16 (0.15)	9th (4LLH) Gear	182 (83.3)	60 (17.6)	28.74 (97.05)
231.19 (172.47)	16689 (74.24)	5.19 (8.36)	2099	3.76 (0.15)	10th (5LL) Gear	182 (83.3)	60 (17.6)	28.76 (97.12)
228.45 (170.36)	15078 (67.07)	5.68 (9.14)	2100	3.27 (0.15)	11th (1HH) Gear	182 (83.3)	60 (17.6)	28.76 (97.12)
225.24 (167.96)	13598 (59.60)	6.30 (10.15)	2099	2.78 (0.15)	12th (5LLH) Gear	185 (83.6)	60 (17.6)	28.75 (97.08)
227.66 (169.76)	10760 (47.86)	7.95 (12.77)	2096	2.20 (0.15)	13th (2HL) Gear	185 (83.8)	60 (17.6)	28.75 (97.08)
225.60 (168.21)	9480 (42.17)	8.92 (14.36)	2101	2.03 (0.15)	14th (3HL) Gear	185 (83.8)	60 (17.6)	28.74 (97.05)

Department of Agricultural Engineering

Dates of Test: September 23 to October 2, 1985

Manufacturer: STEIGER TRACTOR INC., 406 Main Avenue, Fargo, North Dakota 58126

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 36.9 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8422 Fuel weight 7.012 lb/gal (0.840 kg/l) Oil SAE 15W-40 API service classification CD, SE, CC To motor 5.861 gal (22.184 l) Drained from motor 5.202 gal (19.690 l) Transmission and final drive lubricant Steiger hydraulic/transmission fluid Total time engine was operated 55.5 hours.

ENGINE: Make Caterpillar Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. 64Z05842 Crankshaft lengthwise Rated rpm 2100 Bore and stroke 4.75" x 6.00" (120.7 mm x 152.4 mm) Compression ratio 15.0 to 1 Displacement 638 cu in (10.455 l) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic oil, radiator for transmission oil Fuel filter one paper cartridge and prestrainer Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive with duals Serial No. C03-05307 Tread width rear 64" (1625 mm) to 130" (3302 mm) front 64" (1625 mm) to 130" (3302 mm) Wheel base 130" (3302 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 72" (1829 mm) Vertical distance above roadway 46" (1168 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (2) range operator controlled powershift Advertised speeds mph (km/h) first 1.8 (2.9) second 2.1 (3.4) third 2.9 (4.7) fourth 3.3 (5.3) fifth 3.5 (5.6) sixth 3.9 (6.3) seventh 4.0 (6.4) eighth 4.7 (7.6) ninth 4.8 (7.7) tenth 5.2 (8.4) eleventh 5.6 (9.0) twelfth 6.2 (10.0) thirteenth 7.8 (12.6) fourteenth 8.7 (14.0) fifteenth 9.4 (15.1) sixteenth 10.5 (16.9) seventeenth 10.7 (17.2) eighteenth 12.9 (20.8) nineteenth 13.8 (22.2) twentieth 16.6 (26.7) reverse 3.2 (5.2), 3.9 (6.3), 8.7 (14.0), 10.4 (16.8) Clutch wet multiple disc hydraulically power actuated and operated by foot pedal Brakes caliper disc hydraulically operated by foot pedal Steering hydrostatic and articulated Turning radius (on concrete surface without brake) right 240" (6.1 m) left 240" (6.1 m) Turning space diameter (on concrete surface without brake) right 501" (12.73 m) left 501" (12.73 m) Power take-off 999 rpm at 2100 engine rpm Unladen tractor mass 26460 lb (12092 kg).

LUGGING ABILITY IN 10th (5LL) GEAR

Crankshaft Speed rpm	2099	1891	1685	1474	1258	1045
Pull—lb (kN)	16689 (74.24)	19036 (87.13)	20967 (94.27)	21528 (95.76)	21441 (95.17)	20506 (90.13)
Increase in Pull %	0	18	26	29	28	22
Power—Hp (kW)	231.19 (172.40)	242.55 (180.85)	229.64 (171.25)	205.36 (151.28)	174.59 (130.16)	157.93 (117.85)
Speed—Mph (km/h)	3.19 (5.16)	4.65 (7.45)	4.11 (6.61)	3.58 (5.76)	3.05 (4.91)	2.55 (4.10)
Slip %	5.76	4.80	5.12	5.45	5.59	5.27

TRACTOR SOUND LEVEL WITH CAB

	dB(A)
Maximum Available Power—Two Hours	77.0
75% of Pull at Maximum Power—Ten Hours	77.5
50% of Pull at Maximum Power—Two Hours	78.0
50% of Pull at Reduced Engine Speed—Two Hours	74.5
Bystander in 20th (5HH) gear	90.5

TIRES, BALLAST AND WEIGHT

Rear Tires	—No. size ply & psi (kPa)	Tuned Without Ballast
Ballast	—Lugless (each) —Cast iron (each)	Four 23.1-54, 8 inner 14 (95) outer 12 (85) None
Front Tires	—No. size ply & psi (kPa)	Four 23.1-54, 8 inner 14 (95) outer 12 (85) None
Ballast	—Lugless (each) —Cast iron (each)	None None
Height of Drawbar		14.5 in (370 mm)
Static Weight with Operator—Rear		15100 lb (6842 kg)
—Front		16500 lb (7484 kg)
—Total		20600 lb (9326 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2500 (172.40)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	130 (54)	
Location	hydraulic reservoir	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	III	*Not measured
LOAD lbs (kg)	12734 (5778)	
TIME sec	3.14	
HITCH POINT MOVEMENT in (mm)		
Lowest position	11.3 (287)	
Top of timed range	37.3 (947)	
Highest position	40.6 (1031)	
LOAD CG MOVEMENT in (mm)		
Lowest position	12.0 (305)	
Top of timed range	38.7 (983)	
Highest position	42.5 (1080)	

*Implement load capacity for transport purposes not specified by manufacturer.

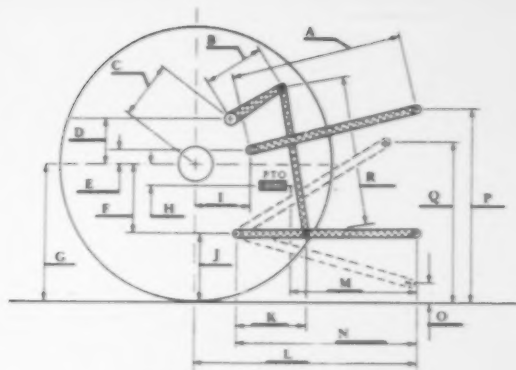
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 139°F (59.5°C). Twelve gears were chosen between 15% slip and 10 mph (16.1 km/h).

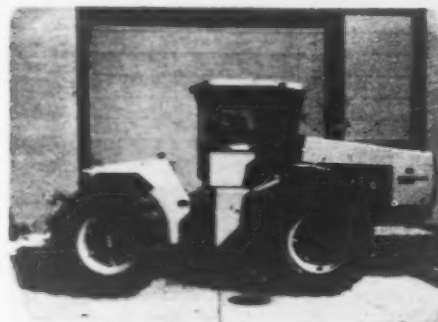
We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1578, October 30, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
T. L. THOMPSON
L. L. BASHFORD
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load



Steiger Cougar CR 1280 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

	inch	mm
A	29.5	749
B	21.0	533
C	25.8	654
D	25.1	638
E	11.4	289
F	9.9	251
G	32.8	832
H	2.2	56
I	25.3	591
J	22.9	581
K	25.0	584
L	52.7	1338
M	57.7	1465
N	25.0	635
O	42.0	1067
P	8.0	203
Q	44.9	1140
R	40.9	1038
S	35.4	899

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NEBRASKA TRACTOR TEST 1543—STEIGER PANTHER IV KM-325 DIESEL 20 SPEED

DRAWBAR PERFORMANCE AT 2100 RPM

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Sip %	Fuel Consumption gal/hr (kg/hr)	Temp. °F (°C)	Barom. in. Hg (kPa)
Maximum Available Power — Two Hours 10th (SB) Gear							
276.11 (205.90)	15276 (67.95)	6.78 (10.92)	2100 (170.99)	5.63 (11.67)	17.209 (65.144)	0.455 (0.204)	16.04 (1.161)
75% of Pull at Maximum Power — Two Hours 10th (SB) Gear							
229.31 (170.99)	11855 (52.73)	7.25 (11.67)	2224 (170.99)	2.73 (11.67)	15.501 (58.679)	0.471 (0.204)	14.79 (1.161)
50% of Pull at Maximum Power — Two Hours 10th (SB) Gear							
156.50 (116.70)	7902 (35.15)	7.45 (11.95)	2257 (170.99)	1.88 (11.95)	12.039 (45.174)	0.536 (0.204)	13.00 (1.161)
50% of Pull at Reduced Engine Speed — Two Hours 14th (4B) Gear							
156.52 (116.72)	7901 (35.15)	7.45 (11.95)	1566 (170.99)	1.80 (11.95)	9.781 (37.024)	0.456 (0.204)	16.00 (1.161)

MAXIMUM POWER IN SELECTED GEARS

250.56 (171.78)	32505 (144.85)	2.65 (4.27)	2166 (170.99)	14.90 (11.81)	5th (1C) Gear	180 (82.2)	42 (5.6)	45 (7.2)	28.46 (96.11)
251.55 (187.58)	31586 (139.62)	5.01 (8.04)	2100 (170.99)	11.81 (5.71)	4th (1D) Gear	189 (82.2)	42 (5.6)	45 (7.2)	28.47 (96.14)
268.17 (199.88)	28554 (126.06)	5.55 (5.71)	2099 (170.99)	8.54 (5.71)	5th (2A) Gear	181 (82.8)	60 (15.6)	65 (17.2)	28.97 (97.83)
273.85 (204.21)	25240 (112.27)	4.07 (6.55)	2099 (170.99)	6.79 (6.55)	6th (2B) Gear	181 (82.8)	60 (15.6)	64 (17.8)	28.97 (97.83)
274.17 (204.45)	21962 (97.68)	4.68 (7.53)	2099 (170.99)	5.51 (7.53)	7th (2C) Gear	182 (83.1)	61 (16.1)	66 (18.9)	28.97 (97.83)
275.16 (205.18)	19426 (86.41)	5.51 (8.55)	2097 (170.99)	4.66 (8.55)	8th (2D) Gear	183 (83.6)	65 (17.2)	69 (20.6)	28.96 (97.79)
282.45 (210.61)	17674 (78.62)	5.99 (9.64)	2100 (170.99)	4.11 (9.64)	9th (5A) Gear	185 (83.6)	64 (17.8)	71 (21.7)	28.97 (97.83)
285.67 (213.03)	15804 (70.50)	6.78 (10.92)	2100 (170.99)	5.55 (10.92)	10th (5B) Gear	184 (83.2)	65 (18.1)	75 (22.8)	28.99 (97.89)
282.55 (210.78)	15677 (69.84)	7.75 (12.47)	2099 (170.99)	5.15 (12.47)	11th (5C) Gear	182 (83.3)	65 (18.1)	75 (22.8)	28.98 (97.86)
280.77 (209.37)	12016 (53.45)	8.76 (14.10)	2097 (170.99)	2.58 (14.10)	12th (5D) Gear	182 (83.3)	64 (17.8)	72 (22.2)	28.98 (97.86)

LUGGING ABILITY IN 10th (SB) GEAR

Crankshaft Speed rpm	2100	1880	1681	1464	1250	1042
Pull—lbs (kN)	15804 (70.50)	18412 (81.90)	20651 (91.77)	22890 (101.82)	25545 (114.73)	18487 (82.23)
Increase in Pull %	0	17	31	45	49	17
Power—Hp (kW)	285.67 (213.03)	295.86 (220.63)	294.04 (219.26)	281.54 (209.94)	246.09 (181.51)	164.19 (122.44)
Speed—Mph (km/h)	6.78 (10.92)	6.05 (9.70)	5.54 (8.60)	4.61 (7.42)	3.92 (6.31)	3.55 (5.70)
Sip %	5.55	4.42	5.05	5.97	6.42	4.58

	1700 RPM dB(A)	1900 RPM dB(A)	2100 RPM dB(A)
Maximum Available Power—Two Hours	78.0	77.5	79.0
75% of Pull at Maximum Power—Ten Hours			79.0
50% of Pull at Maximum Power—Two Hours			78.5
50% of Pull at Reduced Engine Speed—Two Hours			76.5
Bystander in 18th (5B) gear			104.0

Department of Agricultural Engineering

Dates of Test: October 9 to 16, 1984

Manufacturer: STEIGER TRACTOR, INC., 406
Main Avenue, Fargo, North Dakota 58126

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 46.8 (rating taken from oil company's
inspection data) Specific gravity converted to 60°
60°F (15/15°C) 0.8575 Fuel weight 6.973 lb/gal
(0.836 kg/l) Oil SAE 10W-30 API service class-
ification SE-SF, CC-CD To motor 8.256 gal
(31.251 l) Drained from motor 7.409 gal (28.048 l)
Transmission and hydraulic lubricant SAE 10
hydraulic oil Final drive lubricant SAE 80W-90
Total time engine was operated 47.5 hours.

ENGINE: Make-Cummins Diesel Type six cyl-
inder vertical with turbocharger and intercooler
Serial No. 18107122 Crankshaft lengthwise Rated
rpm 1700 to 2100 Bore and stroke 5.5" x 6.0"
(139.7 mm x 152.4 mm) Compression ratio 14.1
to 1 Displacement 855 cu in (14011 ml) Starting
system 12 volt Lubrication pressure Air cleaner
two paper elements and aspirator Oil filter one
full flow cartridge and one bypass cartridge Oil
cooler engine coolant heat exchanger for crank-
case oil, radiator for hydraulic oil, radiator for
transmission and transfer case oil Fuel filter two
paper cartridges Muffler none Cooling medium
temperature control one thermostat.

CHASSIS: Type four wheel drive with dual
Serial No. 107-03838 Tread width rear 79" (2007
mm) to 136.5" (3462 mm) front 79" (2007 mm) to
136.3" (3462 mm) Wheel base 129" (3277 mm)
Center of gravity (without operator or ballast, with
minimum tread, with fuel tank filled and tractor
serviced for operation) Horizontal distance from
forward from center-line of rear wheels 77.9" (1978
mm) Vertical distance above roadway 45.5" (1156
mm) Horizontal distance from center of rear wheel
tread 0" (0 mm) to the right/left Hydraulic control
system direct engine drive Transmission selective
gear fixed ratio Advertised speeds mph (km/h)
first 2.3 (3.7) second 2.6 (4.2) third 3.0 (4.8) fourth
3.4 (5.5) fifth 3.8 (6.1) sixth 4.5 (6.9) seventh 4.9
(7.9) eighth 5.5 (8.8) ninth 6.1 (9.8) tenth 7.0 (11.3)
eleventh 7.8 (12.5) twelfth 8.9 (14.1) thirteenth 10.2
(16.4) fourteenth 11.5 (18.5) fifteenth 13.0 (20.9)
sixteenth 14.8 (23.8) seventeenth 15.8 (25.4) eight-
eenth 18.0 (29.0) nineteenth 20.5 (32.7) twentieth
23.1 (37.2) reverse 2.3 (3.7), 2.6 (4.2), 3.0 (4.8), 3.4
(5.5) Clutch dual dry disc hydraulically operated
by foot pedal Brakes dual caliper, single disc hy-
draulically actuated by foot pedal Steering hy-
drostatic and articulated Turning radius (on
concrete surface without brake) right 285" (7.19
m) left 288" (7.32 m) Turning space diameter (on
concrete surface without brake) right 590" (14.99
m) left 600" (15.24 m) Power take-off none Un-
laden tractor mass 29580 lb (13417 kg).

DRAWBAR PERFORMANCE AT 1900 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (liters/hr)	Temp. °F (°C)	Barom. in. Hg (kPa)
					gph (liters/hr)	Cond. ing (mm)	
Maximum Available Power — Two Hours 10th (3B) Gear							
199.69 (148.91)	15550 (69.17)	4.82 (7.73)	1900	3.66	11.545 (43.701)	0.405 (15.247)	17.50 (67.407)
MAXIMUM POWER IN SELECTED GEARS							
190.67 (144.72)	51624 (140.67)	2.14 (3.43)	1987	14.76	4th (1D) Gear	183 (81.9)	44 (6.7)
190.57 (142.11)	29955 (128.71)	2.47 (3.97)	1900	10.20	5th (2A) Gear	184 (84.4)	47 (8.1)
196.20 (146.31)	25750 (114.45)	2.86 (4.60)	1900	7.66	6th (2B) Gear	184 (84.4)	49 (9.4)
198.88 (148.30)	22744 (101.17)	3.28 (5.28)	1901	6.38	7th (2C) Gear	186 (85.3)	51 (10.6)
202.24 (150.81)	20208 (89.89)	3.75 (6.04)	1900	4.82	8th (2D) Gear	185 (84.7)	44 (6.7)
202.51 (150.86)	17847 (79.19)	4.25 (6.84)	1900	4.18	9th (3A) Gear	185 (85.0)	44 (6.7)
203.51 (151.61)	15829 (70.41)	4.82 (7.73)	1900	3.62	10th (3B) Gear	185 (85.0)	45 (8.1)
201.85 (150.52)	15851 (61.81)	5.46 (8.79)	1901	3.21	11th (3C) Gear	185 (85.0)	44 (6.7)
200.79 (149.73)	12177 (54.17)	6.18 (9.93)	1901	2.71	12th (3D) Gear	186 (85.3)	44 (6.7)
199.84 (149.02)	10476 (46.80)	7.15 (11.51)	1899	2.50	15th (4A) Gear	186 (85.3)	45 (7.2)
197.19 (147.04)	9144 (40.67)	8.09 (13.01)	1900	1.96	14th (4B) Gear	185 (84.7)	45 (7.2)

DRAWBAR PERFORMANCE AT 1700 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (liters/hr)	Temp. °F (°C)	Barom. in. Hg (kPa)
					gph (liters/hr)	Cond. ing (mm)	
Maximum Available Power — Two Hours 10th (3B) Gear							
198.75 (148.21)	17996 (77.38)	4.28 (6.89)	1700	4.18	11.380 (43.077)	0.599 (22.43)	17.47 (64.41)
MAXIMUM POWER IN SELECTED GEARS							
179.85 (134.10)	51205 (118.80)	2.16 (3.48)	1752	14.82	5th (2A) Gear	186 (85.3)	48 (8.9)
190.40 (141.98)	28551 (126.91)	2.50 (4.03)	1699	9.78	6th (2B) Gear	187 (85.8)	50 (10.6)
196.18 (146.29)	25571 (112.86)	2.90 (4.67)	1701	7.51	7th (2C) Gear	185 (85.0)	51 (10.6)
198.48 (148.00)	22562 (99.47)	3.35 (5.36)	1698	5.45	8th (2D) Gear	187 (85.8)	44 (6.7)
200.48 (149.98)	19885 (88.44)	3.78 (6.08)	1700	4.90	9th (3A) Gear	188 (86.4)	44 (6.7)
200.70 (151.13)	17722 (78.83)	4.29 (6.90)	1701	4.10	10th (3B) Gear	188 (86.4)	45 (8.1)
201.84 (150.51)	15556 (69.11)	4.87 (7.84)	1701	3.62	11th (3C) Gear	187 (86.1)	44 (6.7)
201.10 (149.98)	15687 (69.88)	5.51 (8.87)	1700	3.04	12th (3D) Gear	189 (86.9)	44 (6.7)
200.97 (149.86)	11807 (52.52)	6.38 (10.27)	1699	2.71	15th (4A) Gear	188 (86.7)	45 (7.2)
199.68 (148.90)	10569 (46.12)	7.22 (11.62)	1701	2.46	14th (4B) Gear	187 (86.1)	45 (7.2)
195.74 (145.94)	8978 (39.93)	8.18 (13.16)	1700	2.05	15th (4C) Gear	186 (85.8)	45 (7.2)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 121°F (49.4°C). Twelve gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1542, December 3, 1984.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD

Board of Tractor Test Engineers

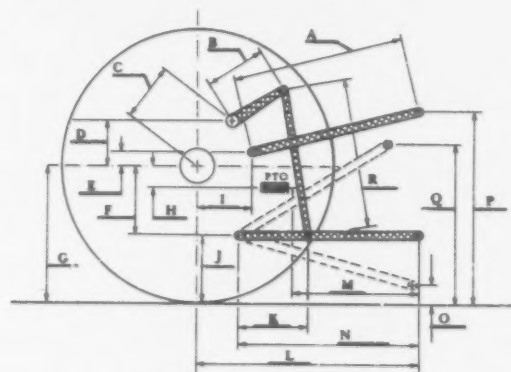
TIRES, BALLAST AND WEIGHT

Rear Tires	—No., Size, ply & psi (kPa)	With Ballast	Without Ballast
Rear Tires	—Liquid (each inner)	Four 23.1-54; 8, inner	Four 23.1-54; 8, inner
Front Tires	—No., Size, ply & psi (kPa)	Four 23.1-54; 8, inner	Four 23.1-54; 8, inner
Ballast	—Liquid (each inner)	14 (93) outer 12 (83)	14 (93) outer 12 (83)
Height of Driver	—Case (each)	1552 lb (704 kg)	1552 lb (704 kg)
Static Weight with Operator—Rear	—Front	15105 lb (6852 kg)	13880 lb (6441 kg)
	—Total	18725 lb (8493 kg)	16480 lb (7479 kg)
		33850 lb (15345 kg)	28400 lb (12882 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2400	16550	
Location	remote		
Hydraulic oil temperature °F (°C)	108	42	
Location	hydraulic reservoir		
	Maximum Lift Capacity		Lift Capacity for Transport
QUICK ATTACH	yes		
CATEGORY	III		*not measured
LOAD lbs (kg)	15460	6105	
TIME sec	3.56		
HITCH POINT MOVEMENT in (mm)			
Lowest position	13.6	346	
Top of timed range	39.6	1006	
Highest position	40.1	1019	
LOAD CG MOVEMENT in (mm)			
Lowest position	13.0	330	
Top of timed range	42.0	1067	
Highest position	42.5	1080	

*Implement load capacity for transport purposes not specified by manufacturer.



Hitch Dimensions as Tested — No Load

	inch	mm
A	31.3	794
B	15.0	381
C	26.8	681
D	22.5	566
E	5.7	143
F	13.5	343
G	32.4	822
H	NA	NA
I	18.1	460
J	18.9	479
K	15.0	381
L	50.1	1273
L'	56.6	1438
M	NA	NA
N	32.0	813
O	8.0	203
P	40.9	1038
Q	36.1	918
R	34.5	870

L' to end of quick attach



Steiger Panther IV KM-325 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1550—STEIGER PANTHER IV SM-325 DIESEL 20 SPEED

DRAWBAR PERFORMANCE AT 2100 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (liters/hr)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barom. in. Hg (kPa)
Maximum Available Power—Two Hours 10th (3B) Gear									
270.89 (202.00)	14996 (66.71)	6.77 (10.90)	2100	5.52	15.825 (59.903)	0.407 (0.248)	17.12 (3.372)	38 (80.3)	39.56 (1.1)
75% of Pull at Maximum Power—Ten Hours 10th (3B) Gear									
219.76 (163.88)	11507 (51.19)	7.16 (11.33)	2100	2.49	13.749 (52.043)	0.436 (0.265)	15.98 (3.149)	176 (79.9)	35 (1.8)
50% of Pull at Maximum Power—Two Hours 10th (3B) Gear									
149.43 (111.41)	7680 (34.14)	7.30 (11.74)	2274	1.73	10.512 (39.792)	0.491 (0.296)	14.22 (2.800)	173 (78.1)	48 (4.7)
50% of Pull at Reduced Engine Speed—Two Hours 14th (4B) Gear									
150.05 (111.29)	7677 (34.13)	7.33 (11.80)	1349	1.69	8.963 (33.929)	0.417 (0.233)	16.74 (3.290)	174 (78.9)	39 (0.3)

MAXIMUM POWER IN SELECTED GEARS

259.71 (178.76)	55651 (149.68)	2.67 (4.30)	2171	14.25	3rd (1C) Gear	176 (79.7)	36 (2.2)	43 (6.1)	29.56 (99.14)
256.58 (191.31)	51890 (141.85)	5.02 (8.06)	2099	11.19	4th (1D) Gear	176 (80.0)	36 (2.2)	43 (6.1)	29.56 (99.14)
268.10 (199.92)	28224 (123.54)	3.56 (5.73)	2101	7.82	5th (2A) Gear	177 (80.3)	36 (2.2)	43 (6.1)	29.56 (99.14)
272.73 (203.37)	25139 (111.82)	4.07 (6.53)	2101	6.57	6th (2B) Gear	176 (80.0)	36 (2.2)	43 (6.1)	29.56 (99.14)
274.67 (204.62)	20228 (97.99)	4.68 (7.52)	2099	5.43	7th (2C) Gear	177 (80.3)	36 (2.2)	44 (6.7)	29.55 (99.11)
274.95 (203.02)	19400 (86.30)	5.31 (8.53)	2101	4.58	8th (2D) Gear	176 (80.0)	35 (1.7)	42 (5.6)	29.54 (99.08)
278.05 (207.33)	17427 (77.52)	5.98 (9.63)	2098	3.80	9th (3A) Gear	177 (80.6)	40 (4.4)	48 (8.9)	29.50 (98.94)
278.99 (207.37)	15580 (68.41)	6.78 (10.91)	2101	3.48	10th (3B) Gear	177 (80.6)	39 (3.9)	47 (8.1)	29.52 (99.01)
275.35 (203.31)	13556 (59.41)	7.73 (12.44)	2098	2.92	11th (3C) Gear	177 (80.3)	41 (5.0)	49 (9.4)	29.29 (98.91)
273.53 (203.97)	11728 (53.17)	8.75 (14.08)	2099	2.43	12th (3D) Gear	176 (80.0)	41 (5.0)	50 (10.0)	29.28 (98.87)

LUGGING ABILITY IN 10th (3B) GEAR

Crankshaft Speed rpm	2101	1889	1680	1476	1256	1048
Pull—lb (kN)	15380 (68.41)	16753 (74.52)	18682 (83.10)	20218 (89.93)	20190 (89.81)	18703 (83.20)
Increase in Pull %	0	9	21	51	51	22
Power—Hp (kW)	278.09 (207.37)	271.37 (202.16)	267.91 (196.78)	253.49 (189.02)	215.35 (160.59)	167.22 (124.70)
Speed—Mph (km/h)	6.78 (10.91)	6.07 (9.78)	5.38 (8.63)	4.70 (7.52)	4.00 (6.44)	3.35 (5.40)
Slip %	5.48	3.80	4.27	4.58	4.74	4.27

TRACTOR SOUND LEVEL WITH CAB

	1700 RPM dB(A)	1900 RPM dB(A)	2100 RPM dB(A)
Maximum Available Power—Two Hours	77.0	79.0	80.5
75% of Pull at Maximum Power—Ten Hours			81.5
50% of Pull at Maximum Power—Two Hours			81.0
50% of Pull at Reduced Engine Speed—Two Hours			75.0
Bystander in 10th (3B) gear			100.0

Department of Agricultural Engineering

Dates of Test: November 16 to 26, 1984

Manufacturer: STEIGER TRACTOR, INC., 406
Main Avenue, Fargo, North Dakota 58126

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cetane No. 46.8 (rating taken from oil company's
inspection data) Specific gravity (converted to 60°
60°F (15/15°C) 0.8375 Fuel weight 6.973 lb/gal
(0.836 kg/l) Oil SAE 15W-40 API service clas-
sification SE-SF, CC-CD To motor 6.556 gal
(24.818 l) Drained from motor 5.885 gal (22.276 l)
Transmission and hydraulic lubricant SAE 10
hydraulic oil Final drive lubricant SAE 80W-90
Total time engine was operated 39.5 hours.

ENGINE: Make Komatsu Diesel Model
SA6D125-4 Type six cylinder vertical with tur-
bocharger and intercooler Serial No. 11296
Crankshaft lengthwise Rated rpm 1700 to 2100
Bore and stroke 4.921" x 5.906" (125 mm x 150
mm) Compression ratio 14.5 to 1 Displacement
674 cu in (11045 ml) Starting system 12 volt Lu-
brication pressure Air cleaner two paper ele-
ments and aspirator Oil filter one full flow
cartridge Oil cooler engine coolant heat exchan-
ger for crankcase oil, radiator for hydraulic oil,
radiator for transmission and transfer case oil
Fuel filter one paper cartridge and water separ-
ator Muffler none Cooling medium tempera-
ture control two thermostats.

CHASSIS: Type four wheel drive with duals
Serial No. 119-04028 Tread width rear 79" (2007
mm) to 136.3" (3462 mm) front 79" (2007 mm) to
136.3" (3462 mm) Wheel base 129" (3277 mm)
Center of gravity (without operator or ballast, with
minimum tread, with fuel tank filled and tractor
serviced for operation) Horizontal distance for-
ward from center-line of rear wheels 76.0" (1930
mm) Vertical distance above roadway 45.5" (1156
mm) Horizontal distance from center of rear wheel
tread 0" (0 mm) to the right/left Hydraulic control
system direct engine drive Transmission selective
gear fixed ratio Advertised speeds mph (km/h)
first 2.3 (3.7) second 2.6 (4.2) third 3.0 (4.8) fourth
3.4 (5.5) fifth 3.8 (6.1) sixth 4.3 (6.9) seventh 4.9
(7.9) eighth 5.5 (8.8) ninth 6.1 (9.8) tenth 7.0 (11.3)
eleventh 7.8 (12.5) twelfth 8.9 (14.3) thirteenth
10.2 (16.4) fourteenth 11.5 (18.5) fifteenth 13.0
(20.9) sixteenth 14.8 (23.8) seventeenth 15.8 (25.4)
eighteenth 18.0 (29.0) nineteenth 20.5 (32.7) twen-
tieth 23.1 (37.2) reverse 2.3 (3.7), 2.6 (4.2), 3.0
(4.8), 3.4 (5.5) Clutch dual dry disc hydraulically
operated by foot pedal Brakes dual caliper, single
disc hydraulically actuated by foot pedal Steering
hydrostatic and articulated Turning radius (on
concrete surface without brake) right 283" (7.19
m) left 288" (7.32 m) Turning space diameter (on

DRAWBAR PERFORMANCE AT 1600 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Temp. °F (°C)	Air inlet temp (°F)	Air dry bulb (°F)	Burner inlet (°F)
Maximum Available Power — Two Horse 10th (5th) Gear									
208.18	16434	6.12	1901	5.60	15.252	0.397	17.38	39	41
(159.99)	(73.19)	(9.82)			(57.734)	(0.241)	(3.464)	(80.8)	(5.9)

MAXIMUM POWER IN SELECTED GEARS

244.93	53487	2.74	1908	14.57	4th (1D) Gear	176	36	43	29.36
(182.64)	(148.96)	(4.41)				(80.8)	(2.3)	(6.1)	(99.14)
254.53	50588	3.17	1909	9.18	5th (2A) Gear	176	36	43	29.36
(191.36)	(133.17)	(5.09)				(79.7)	(2.3)	(6.1)	(99.14)
263.29	27124	5.84	1908	7.51	6th (2B) Gear	176	36	44	29.36
(196.34)	(120.63)	(9.86)				(79.7)	(2.3)	(6.7)	(99.14)
264.94	23619	4.21	1901	5.97	7th (2C) Gear	176	36	43	29.35
(197.37)	(103.86)	(6.77)				(80.8)	(2.3)	(6.1)	(99.11)
268.67	21067	4.78	1901	5.13	8th (2D) Gear	176	34	41	29.34
(200.53)	(93.67)	(7.70)				(80.8)	(1.1)	(5.8)	(99.08)
269.67	18754	5.40	1900	4.27	9th (3A) Gear	177	40	48	29.30
(201.99)	(82.33)	(8.89)				(80.8)	(6.4)	(8.9)	(98.94)
270.90	16571	6.11	1899	3.80	10th (3B) Gear	177	40	48	29.31
(201.41)	(73.71)	(9.89)				(80.3)	(6.4)	(8.9)	(98.94)
268.55	14489	6.98	1908	3.24	11th (3C) Gear	177	41	49	29.29
(200.99)	(64.43)	(11.33)				(80.3)	(3.8)	(9.4)	(98.91)
267.96	12706	7.91	1902	2.68	12th (3D) Gear	176	41	50	29.28
(199.82)	(54.32)	(13.73)				(79.7)	(3.8)	(10.0)	(98.87)
264.07	10886	9.10	1900	2.35	13th (4A) Gear	176	41	50	29.28
(196.92)	(48.42)	(14.64)				(80.8)	(3.8)	(10.0)	(98.87)

DRAWBAR PERFORMANCE AT 1700 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Temp. °C	Air in temp	Air dry temp	Burner inlet temp
Maximum Available Power — Two Hours 10th (38) Gen									
266.92	18354	5.64	1890	4.19	14.707	0.386	18.00	176	41
(199.89)	(81.37)	(8.77)			(53.671)	(0.233)	(3.562)	(80.8)	(97.63)

MAXIMUM POWER IN SELECTED GEARS

240.15	53555	2.60	1709	14.44	5th (2A) Gear	176	36	43	29.36
(179.00)	(149.17)	(4.33)				(80.8)	(2.3)	(6.1)	(99.14)
256.27	29957	3.21	1705	8.97	6th (2B) Gear	176	36	44	29.35
(191.10)	(133.23)	(5.14)				(79.7)	(2.3)	(6.7)	(99.11)
259.99	26909	3.72	1699	6.94	7th (2C) Gear	176	36	43	29.35
(199.00)	(114.58)	(5.99)				(80.8)	(2.3)	(6.1)	(99.11)
264.08	23336	4.34	1690	5.82	8th (2D) Gear	176	34	41	29.34
(196.93)	(107.80)	(6.83)				(80.8)	(1.1)	(5.8)	(99.08)
267.10	20672	4.80	1700	4.82	9th (3A) Gear	176	40	48	29.29
(199.17)	(92.84)	(7.72)				(80.8)	(6.4)	(8.9)	(98.91)
268.68	18530	5.44	1699	4.27	10th (3B) Gear	176	40	48	29.31
(200.34)	(82.43)	(8.73)				(80.8)	(6.4)	(8.9)	(98.91)
266.96	16073	6.23	1701	5.40	11th (3C) Gear	176	41	49	29.29
(199.00)	(71.49)	(10.02)				(80.8)	(3.8)	(9.4)	(98.91)
264.89	14115	7.94	1698	3.08	12th (3D) Gear	176	41	50	29.28
(197.33)	(63.78)	(13.31)				(80.8)	(3.8)	(10.0)	(98.87)
263.61	12175	8.12	1701	2.76	13th (4A) Gear	176	41	50	29.28
(196.77)	(54.13)	(13.07)				(79.7)	(3.8)	(10.0)	(98.87)

concrete surface without brake) right 590° (14.99 m) left 600° (15.24 m) Power take-off none Unladen tractor mass 28725 lb (13030 kg).

REPAIRS AND ADJUSTMENTS: During the warm-up for the initial drawbar test run, coolant was detected in the No. 3 cylinder. The injector cap screws had inadequate torque. Gaskets were replaced and the test continued.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 114°F (45.6°C). Ten gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1580, December 10, 1984.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

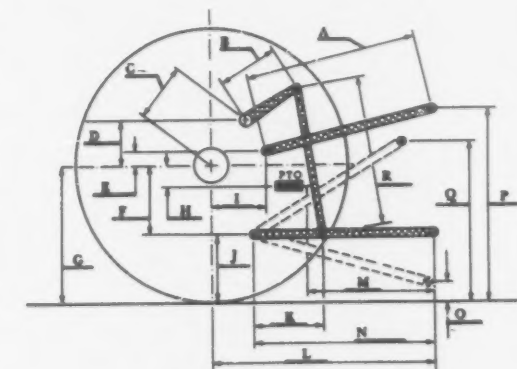
TIRES, BALLAST AND WEIGHT

Base Tires	—No. 3, 16.5 x 30 (16.5 x 30)	With Ballast	Four 25.1-54; 8; inner 14 (99) outer 12 (82)	Without Ballast	Four 25.1-54; 8; inner 14 (99) outer 12 (82)
Ballast	—Liquid (each inner) —Cast iron (each)	None	1215 lb (551 kg)	None	None
Front Tires	—No. 3, 16.5 x 30 (16.5 x 30)	Four 25.1-54; 8; inner 14 (99) outer 12 (82)	1500 lb (680 kg)	Four 25.1-54; 8; inner 14 (99) outer 12 (82)	1500 lb (680 kg)
Ballast	—Liquid (each inner) —Cast iron (each)	None	17.5 in (443 mm)	None	None
Height of Drawbar	—Base	14210 lb (6446 kg)	11700 lb (5343 kg)	11700 lb (5343 kg)	11700 lb (5343 kg)
Static Weight with Operator	—Base	18750 lb (8491 kg)	17750 lb (7991 kg)	17750 lb (7991 kg)	17750 lb (7991 kg)
	—Total	53950 lb (24471 kg)	53950 lb (24471 kg)	53950 lb (24471 kg)	53950 lb (24471 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2450	16890
Location	remote	
Hydraulic oil temperature °F (°C)	101	38
Location	hydraulic reservoir	
	Maximum Lift Capacity	Lift Capacity See Transport
QUICK ATTACH CATEGORY	yes	
LOAD lb (kg)	13058	3914
TIME sec	5.72	
HITCH POINT MOVEMENT in (mm)		
Lowest position	15.1	333
Top of timed range	39.1	994
Highest position	40.0	1016
LOAD CG MOVEMENT in (mm)		
Lowest position	15.0	330
Top of timed range	43.4	1078
Highest position	45.5	1105

*Implement load capacity for transport purposes not specified by manufacturer.



Hitch Dimensions as Tested — No Load

	inch	mm
A	50.8	781
B	15.0	381
C	26.8	681
D	22.5	566
E	5.7	143
F	13.5	343
G	52.0	813
H	NA	NA
I	18.1	460
J	18.5	470
K	15.0	381
L	50.1	1273
L'	56.6	1438
M	NA	NA
N	52.0	813
O	8.0	203
P	40.5	1029
Q	36.0	914
R	34.0	864

L' to end of quick attach



Steiger Panther IV SM-325 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Chutvedi, Dean and Director

NEBRASKA TRACTOR TEST 1544—STEIGER PANTHER IV CM-360 DIESEL 20 SPEED

Department of Agricultural Engineering

Date of Test: October 13 to 24, 1984

Manufacturer: STEIGER TRACTOR, INC. 406
Main Avenue, Fargo, North Dakota 58126

FUEL, OIL AND TIME: Fuel No. 2 Diesel
Cottone No. 46.8 (rating taken from oil company's
specification data) Specific gravity converted to 60°
60°F (15.6°C) 0.8575 Fuel weight 6.975 lb/gal
(0.816 kg/l) Oil SAE 10W-30 API service clas-
sification SE-SF, CC-CD To motor 7.941 gal
(30.059 l) Drained from motor 6.879 gal
(26.040 l) Transmission and hydraulic lubricant
SAE 10 hydraulic oil Final drive lubricant SAE
80W-90 Total time engine was operated 58.0
hours.

ENGINE: Make Caterpillar Diesel Type six cylin-
der with turbocharger and intercooler Serial
No. 6TD01109 Crankshaft lengthwise Rated rpm
1700 to 2100 Bore and stroke 5.0" x 6.5" (127
mm x 165 mm) Compression ratio 14.5 to 1 Dis-
placement 393 cu in (6.46 m³) Starting system
12 volt Lubrication pressure Air cleaner two pa-
per elements and aspirator Oil filter one full flow
paper cartridge Oil cooler engine coolant heat
exchanger for crankcase oil, radiator for hydraulic
oil, radiator for transmission and transfer case oil
Fuel filter one paper cartridge and prestrainer
Muffler none Cooling medium temperature control
one thermostat.

CHASSIS: Type four wheel drive with duals
Serial No. 115-05418 Tread width rear 79" (2007
mm) to 136.5" (3462 mm) front 79" (2007 mm) to
136.5" (3462 mm) Wheel base 129" (3277 mm)
Center of gravity (without operator or ballast, with
minimum tread, with fuel tank filled and tractor
serviced for operation) Horizontal distance for-
ward from center line of rear wheels 79.1" (2019
mm) Vertical distance above roadway 45.5" (1156
mm) Horizontal distance from center of rear wheel
tread 0" (0 mm) to the right/left Hydrostatic control
system direct engine drive Transmission selective
gear fixed ratio Advancing speeds mph (km/h)
first 2.5 (4.0) second 2.6 (4.2) third 3.0 (4.8) fourth
3.4 (5.5) fifth 3.8 (6.1) sixth 4.3 (6.9) seventh 4.9
(7.9) eighth 5.5 (8.8) ninth 6.1 (9.8) tenth 7.0 (11.3)
eleventh 7.8 (12.5) twelfth 8.9 (14.3) thirteenth
10.2 (16.4) fourteenth 11.5 (18.5) fifteenth 13.0
(20.9) sixteenth 14.8 (23.8) seventeenth 15.8 (25.4)
eighteenth 18.0 (29.0) nineteenth 20.5 (32.7) twen-
tieth 25.1 (40.4) reverse 2.5 (4.0), 2.6 (4.2), 3.0
(4.8), 3.4 (5.5) Clutch dual dry disc hydraulically
operated by foot pedal Brakes dual caliper, single
disc hydraulically actuated by foot pedal Steering
hydromatic and articulated Turning radius (on
concrete surface without brakes) right 203" (7.19
m) left 208" (7.32 m) Turning space diameter (on

DRAWBAR PERFORMANCE AT 2100 RPM

Power Hhp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crab- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Rel. g/hr (kg/hr)	Temp. °F (°C)	Air temp. °F (°C)	Barom. in. Hg (mm Hg)
Maximum Available Power — Two Hours 10th (SR) Gear									
515.12 (234.66)	17575 (78.17)	6.72 (10.82)	2099	4.59	19.745 (78.755)	0.457 (0.206)	15.36 (8.500)	103 (37.6)	47 (14.5)
75% of Pull at Maximum Power — Two Hours 10th (SR) Gear									
255.29 (120.37)	15171 (68.37)	7.05 (11.33)	2175	5.22	16.809 (63.789)	0.400 (0.200)	15.15 (8.400)	107 (37.5)	48 (92.0)
50% of Pull at Maximum Power — Two Hours 10th (SR) Gear									
171.90 (128.23)	10987 (49.40)	7.19 (11.77)	2196	5.27	12.945 (49.990)	0.325 (0.118)	15.29 (8.673)	101 (36.3)	46 (92.3)
50% of Pull at Reduced Engine Speed — Two Hours 14th (SR) Gear									
171.80 (128.11)	8996 (39.88)	7.19 (11.77)	1525	2.10	10.805 (40.145)	0.450 (0.262)	16.20 (9.100)	104 (36.2)	45 (92.7)

MAXIMUM POWER IN SELECTED GEARS

Power Hhp (kW)	Drawbar pull lb (N)	Speed mph (km/h)	Crab- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Rel. g/hr (kg/hr)	Temp. °F (°C)	Air temp. °F (°C)	Barom. in. Hg (mm Hg)
265.06	20329	5.31	2108	14.97	10th (2A) Gear	184	37	40	29.12
(123.50)	(91.80)	(8.52)				(81.4)	(2.3)	(4.8)	(94.1)
507.87	29281	5.94	2099	9.63	8th (2B) Gear	185	42	35	29.20
(229.56)	(130.23)	(9.51)				(83.4)	(5.8)	(11.3)	(94.0)
515.17	25525	6.50	2099	7.25	7th (2C) Gear	185	45	34	29.25
(233.33)	(113.34)	(10.46)				(83.4)	(7.2)	(13.2)	(94.0)
520.64	22678	5.25	2099	5.90	8th (2D) Gear	188	46	33	29.20
(240.89)	(102.76)	(8.43)				(85.4)	(7.8)	(13.8)	(94.0)
525.84	20485	5.95	2100	5.06	9th (3A) Gear	187	46	33	29.20
(243.46)	(92.11)	(9.54)				(85.3)	(7.8)	(13.8)	(94.0)
524.84	18102	6.75	2100	4.43	10th (3B) Gear	183	44	32	29.23
(242.24)	(80.32)	(10.83)				(83.3)	(6.7)	(12.1)	(94.7)
522.29	15707	7.69	2099	5.72	11th (3C) Gear	185	44	33	29.22
(240.33)	(69.47)	(12.36)				(85.3)	(6.7)	(12.1)	(94.6)
520.57	15768	8.71	2099	5.16	12th (3D) Gear	185	45	34	29.21
(238.88)	(69.33)	(14.02)				(85.3)	(7.2)	(13.2)	(94.6)

LUGGING ABILITY IN 10th (SR) GEAR

Crabshaft Speed rpm	2100	1801	1679	1505	1292	1005
Pull—lb (N)	15102 (67.32)	20964 (93.25)	22500 (100.52)	23660 (105.28)	24200 (107.95)	25061 (112.67)
Increase in Pull %	0	36	25	51	54	28
Power—Hhp (kW)	524.84 (242.24)	555.64 (249.80)	519.55 (238.44)	290.57 (214.49)	253.00 (188.04)	201.55 (150.14)
Speed—mph (km/h)	6.75 (10.83)	5.97 (9.60)	5.30 (8.51)	4.60 (7.40)	5.91 (9.29)	5.27 (7.26)
Slip %	4.45	5.57	5.82	8.43	6.58	6.43

TRACTOR SOUND LEVEL WITH CAB	1700 RPM dB(A)	1800 RPM dB(A)	2100 RPM dB(A)
Maximum Available Power—Two Hours	79.0	78.5	78.5
75% of Pull at Maximum Power—Two Hours			79.0
50% of Pull at Maximum Power—Two Hours			78.5
50% of Pull at Reduced Engine Speed—Two Hours			76.0
Bystander in 10th (SR) gear			102.0

DRAWBAR PERFORMANCE AT 1900 RPM

Power hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft rpm	Sig %	Fuel Consumption gal/hr (L/hr)	Temp. T (°C)	Oil temp °C	Rev. min/hp (kg/kW)			
Maximum Available Power — Two Hours 18th (50) Gear											
514.52	20162	6.05	1900	5.23	19.405	19.520	16.58	184	36	37	28.65
(241.85)	(89.66)	(1.72)			(74.970)	(22.740)	(7.226)	(84.4)	(17.3)	(17.4)	(107.56)
MAXIMUM POWER IN SELECTED GEARS											
501.24	22320	5.50	1970	14.00	4th (20) Gear	185	39	44	29.13		
(224.64)	(147.76)	(1.43)				(83.6)	(15.6)	(16.7)	(107.77)		
514.50	20060	6.07	1900	9.49	7th (20) Gear	185	45	59	29.20		
(234.52)	(129.03)	(1.74)				(83.6)	(17.2)	(17.7)	(108.60)		
521.48	25720	6.69	1900	7.32	8th (20) Gear	185	45	54	29.20		
(234.75)	(124.41)	(1.74)				(83.6)	(17.2)	(17.2)	(108.60)		
532.50	25485	5.51	1900	6.13	9th (20) Gear	185	40	55	29.20		
(247.50)	(108.40)	(1.53)				(83.6)	(15.6)	(17.4)	(108.60)		
534.57	20790	6.05	1800	5.23	10th (20) Gear	184	44	55	29.22		
(249.14)	(92.55)	(1.74)				(84.4)	(16.7)	(17.7)	(108.67)		
532.89	19049	6.02	1900	8.83	11th (20) Gear	184	44	55	29.21		
(248.24)	(88.28)	(1.73)				(84.4)	(16.7)	(17.7)	(108.64)		
533.45	13950	7.85	1902	3.80	12th (20) Gear	184	45	54	29.21		
(248.66)	(58.66)	(2.15)				(84.4)	(17.3)	(17.2)	(108.64)		
530.24	15700	9.05	1800	5.32	13th (20) Gear	184	40	55	29.20		
(248.26)	(60.90)	(2.54)				(84.4)	(15.6)	(17.4)	(108.60)		

DRAWBAR PERFORMANCE AT 1700 RPM

Power (hp)	Drawbar (lb)	Speed (mph)	Crank shaft rpm	Sig %	Fuel Consumption gal/hr (L/hr)	Temp. T (°C)	Oil temp °C	Rev. min/hp (kg/kW)			
514.58	22067	5.56	1700	5.86	18.989	19.519	16.55	184	35	34	28.92
(234.45)	(97.86)	(1.62)			(74.97)	(22.74)	(7.27)	(84.4)	(17.4)	(17.2)	(107.60)

Maximum Available Power — Two Hours 18th (50) Gear

MAXIMUM POWER IN SELECTED GEAR											
298.85	32299	5.47	1905	14.07	4th (20) Gear	185	39	42	29.15		
(232.85)	(147.67)	(1.54)				(83.6)	(15.6)	(17.4)	(107.77)		
297.10	31725	5.51	1600	12.48	7th (20) Gear	185	39	45	29.15		
(221.55)	(141.42)	(1.63)				(83.6)	(15.6)	(17.2)	(108.57)		
306.25	27834	6.15	1600	8.05	8th (20) Gear	185	35	54	29.20		
(228.56)	(125.81)	(1.66)				(83.6)	(17.2)	(17.2)	(108.60)		
316.40	25211	4.71	1700	6.95	9th (20) Gear	184	40	55	29.20		
(225.96)	(112.14)	(1.35)				(84.2)	(15.6)	(17.8)	(108.60)		
322.14	22538	5.56	1600	5.82	10th (20) Gear	185	44	55	29.22		
(246.72)	(100.25)	(1.63)				(83.6)	(16.7)	(17.7)	(108.67)		
322.56	19058	6.16	1600	4.75	11th (20) Gear	184	45	54	29.21		
(246.56)	(87.15)	(1.66)				(84.2)	(17.2)	(17.2)	(108.64)		
322.51	17295	6.99	1700	8.29	12th (20) Gear	184	45	54	29.20		
(246.75)	(78.95)	(2.15)				(84.4)	(17.2)	(17.2)	(108.64)		
324.55	15069	8.07	1700	5.56	13th (20) Gear	184	40	55	29.20		
(241.87)	(67.95)	(2.26)				(84.4)	(15.6)	(17.4)	(108.60)		

TIRES, BALLAST AND WEIGHT

Rear Tires — 36", 5.00 R-15

Ballast — Liquid track (none)

Front Tires — 36", 5.00 R-15

Ballast — Liquid track (none)

Height of Drawbar — 18.5 in. (470 mm)

Total Weight with Operator — Rear

— Front

— Total

With Rollers

Rear 25.1-56 R-15

Ballast — Liquid track (none)

Front 25.1-56 R-15

Ballast — Liquid track (none)

Height of Drawbar — 18.5 in. (470 mm)

Total Weight with Operator — Rear

— Front

— Total

Without Rollers

Rear 25.1-56 R-15

Ballast — Liquid track (none)

Front 25.1-56 R-15

Ballast — Liquid track (none)

Height of Drawbar — 18.5 in. (470 mm)

Total Weight with Operator — Rear

— Front

— Total

concrete surface without brakes; right 500° / 10.99
at left 600° / 15.24 m. Power take-off none. Un-
laden tractor mass 29750 lb (13495 kg).

REPAIRS AND ADJUSTMENTS: No repairs
or adjustments.

REMARKS: All test results were determined
from observed data obtained in accordance with
SAE and ASAE test codes and the technically
equivalent ISO test codes or official Nebraska test
procedure. For the maximum power tests, the fuel
temperature at the injection pump was maintained
at 152°F (55.6°C). Eight gears were chosen between
15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true
and correct report of official Tractor Test No. 1344,
December 5, 1984.

LOUIS I. LEVITZKY

Engineer-in-Charge

K. VON BARGEN

W. E. SPLINTER

L. E. BASHFORD

Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

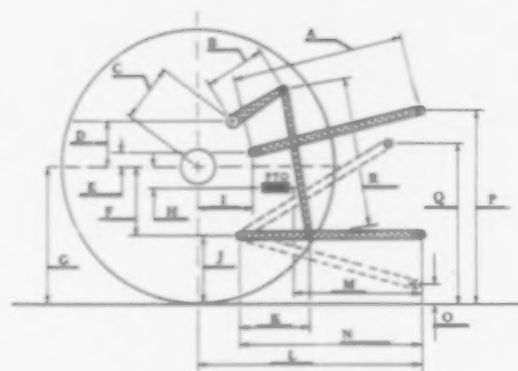
Observed Maximum Pressure psi (kPa)	2600	18750
Location	reservoir	
Hydraulic oil temperature T (°C)	125	51
Location	hydraulic reservoir	

	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	1st	*not measured
LOAD lb (kg)	15520	6042
TIME sec	5.80	

HITCH POINT MOVEMENT in (mm)	
Lower position	14.1 (358)
Top of rated range	80.1 (2049)
Highest position	80.4 (2050)

LOAD CG MOVEMENT in (mm)	
Lower position	15.5 (393)
Top of rated range	42.6 (1087)
Highest position	45.0 (1143)

*Approximate load capacity for transport purposes not specified by manufacturer



Hitch Dimensions as Trained — No Load

	inch	mm
A	51.4	797
B	15.0	381
C	26.8	681
D	22.8	586
E	5.7	145
F	15.5	393
G	51.9	810
H	NA	NA
I	18.1	460
J	18.4	467
K	15.0	381
L	50.1	1273
M	56.6	1438
N	NA	NA
O	32.0	813
P	8.0	203
Q	40.4	1026
R	35.9	911
S	54.0	864

L' to end of quick attach



Steiger Panther IV CM-360 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Oltvedt, Dean and Director

NEBRASKA TRACTOR TEST 1565—VERSATILE 276 DIESEL HYDROSTATIC

Department of Agricultural Engineering

Dates of Test: May 2 to 13, 1985

Manufacturer: VERSATILE FARM EQUIPMENT COMPANY, 1260 Clarence Avenue, Winnipeg, Manitoba, Canada R5T 1T3

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8581 Fuel weight 6.978 lb/gal (10.536 kg) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 2.880 gal (10.902 l) Drained from motor 2.252 gal (8.448 l) Transmission and hydraulic lubricant Versatile HyGear 25 Final drive lubricant SAE 85W90 Hydrostatics fluid Dexron-II ATF Total time engine was operated 41.5 hours.

ENGINE: Make Consolidated Diesel Corporation-Cummins Diesel Type four cylinder vertical with turbocharger and intercooler Serial No. 44119513 Crankshaft lengthwise Rated rpm 2500 Bore and stroke 4.92" x 4.72" (102 mm x 120 mm) Compression ratio 16.5 to 1 Displacement 230 cu in (3.721 m) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydrostatics Oil filter two paper cartridges Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive Serial No. 270 85 241141 Tread width rear 63.4" (1610 mm) to 95.2" (2418 mm) front 63.4" (1610 mm) to 95.2" (2418 mm) Wheel base 86" (2184 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 47.6" (1210 mm) Vertical distance above roadway 37" (940 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission infinitely variable hydrostatic using a variable displacement pump and fixed displacement motor, plus a 3 speed manual transmission Advertised speeds mph (km/h) forward 0-5.9 (0-9.5), 0-8.2 (0-13.1), 0-19.1 (0-30.8) reverse 0-5.9 (0-9.5), 0-8.2 (0-13.1), 0-19.1 (0-30.8) Clutch none Brakes caliper disc hydraulically operated by foot pedal Steering hydrostatic and articulated Turning radius (on concrete surface without brake) right 173.8" (4.41 m) left 173.8" (4.41 m) Turning space diameter (on concrete surface without brake) right 362.8" (9.21 m) left 362.8" (9.21 m) Power take-off 540 rpm at 2448 engine rpm Unladen tractor mass 9020 lb (4091 kg)

POWER TAKE-OFF PERFORMANCE

Power Hhp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)				Barometer inches (kPa)
		gal/hr (l/h)	lb/hp-hr (kg/kW-h)	hp-hr/gal (kW-h/kg)	Cooling medium	wet bulb	dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed — Two hours (PTO Speed—552 rpm)									
100.22 (74.73)	2500	6.184 (23.408)	0.431 (0.262)	16.21 (0.245)	168 (66.7)	62 (16.6)	75 (23.3)	29.95 (101.77)	
Standard Power Take-off Speed (540 rpm) — One Hour									
102.14 (76.26)	2448	6.131 (23.415)	0.425 (0.257)	16.50 (0.250)	169 (66.5)	63 (16.6)	75 (23.3)	29.96 (101.76)	

VARYING POWER AND FUEL CONSUMPTION — Two Hours

Power Hhp (kW)	Crank shaft speed rpm	Fuel Consumption gph (l/h)	lb/hp-hr (kg/kW-h)	hp-hr/gal (kW-h/kg)	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches Hg (kPa)
88.20 (65.73)	2500	5.709 (21.612)	0.432 (0.274)	15.45 (0.245)	169 (66.6)	63 (17.2)	76 (24.4)	
0.00 (0.00)	2718	1.965 (7.437)	—	—	161 (62.5)	63 (16.6)	76 (24.4)	
44.89 (33.47)	2630	5.719 (21.677)	0.578 (0.362)	12.67 (0.175)	190 (77.5)	62 (16.7)	76 (24.2)	
100.45 (74.81)	2500	6.182 (23.405)	0.429 (0.261)	16.25 (0.250)	168 (66.7)	63 (17.2)	77 (24.7)	
22.74 (16.86)	2571	2.880 (10.836)	0.886 (0.556)	7.87 (0.131)	166 (67.5)	64 (17.6)	78 (27.6)	
66.50 (49.66)	2604	4.643 (17.576)	0.486 (0.296)	14.54 (0.226)	193 (76.5)	64 (17.6)	78 (27.6)	
As Ax	55.81 (40.13)	5.620 (21.640)	0.565 (0.350)	12.86 (0.193)	188 (66.5)	65 (17.3)	77 (24.7)	29.95 (101.76)

DRAWBAR PERFORMANCE

Power Hhp (kW)	Drawbar pull lb (kg)	Speed mph (km/h)	Crank shaft speed rpm	Temp. °F (°C)	Fuel Consumption gph (l/h)	lb/hp-hr (kg/kW-h)	hp-hr/gal (kW-h/kg)	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches Hg (kPa)
Maximum Available Power—Two Hours 5.6 MPH 1st Range											
60.64 (45.05)	4058 (1832)	5.61 (9.02)	2501	5.71 (0.376)	6.126 (23.06)	0.614 (0.376)	11.37 (0.216)	167 (66.5)	68 (19.7)	77 (25.3)	28.24 (95.31)
75% of Pull at Maximum Power — Ten Hours 5.6 MPH 1st Range											
56.19 (41.90)	3527 (1586)	5.97 (9.61)	2505	2.78 (0.174)	5.480 (20.744)	0.681 (0.414)	10.25 (0.205)	190 (77.5)	64 (16.6)	71 (21.6)	28.80 (96.51)
50% of Pull at Maximum Power — Two Hours 5.6 MPH 1st Range											
58.73 (43.65)	2351 (1066)	6.18 (9.94)	2610	1.78 (0.110)	4.486 (16.980)	0.808 (0.492)	8.65 (0.152)	193 (76.5)	71 (21.7)	85 (28.3)	28.82 (97.30)
50% of Pull at Reduced Engine Speed — Two Hours Speed Setting — 7.8 MPH 2nd Range at 2500 RPM											
58.74 (43.65)	2351 (1066)	6.18 (9.94)	1901	1.75 (0.110)	5.497 (20.744)	0.630 (0.393)	11.04 (0.193)	168 (66.5)	71 (21.6)	85 (28.3)	28.77 (97.15)

MAXIMUM POWER AT SELECTED SPEEDS

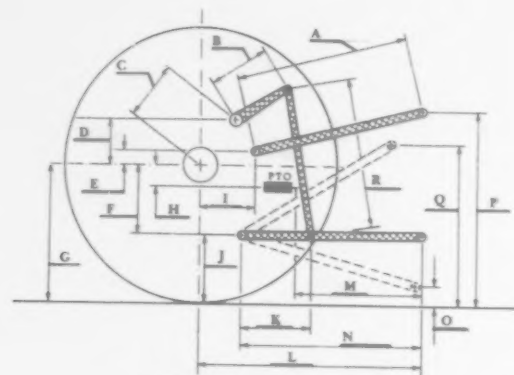
The infinitely variable drive control was set to give the travel speeds shown

Observed Maximum Power (hp/kW)	5000 (20600)	4000 (15875)	3000 (11930)	2000 (7937)	1500 (5953)	1000 (3969)	750 (2976)	500 (1984)	250 (992)
Location	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet
Hydraulic oil temperature °F (°C)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)
Location	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet
Maximum Lift Capacity	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)
Lift Capacity for Transport	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)
QUICK ATTACH CATEGORY	II	II	II	II	II	II	II	II	II
LOAD lbs (kg)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)
TIME sec	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
HITCH POINT MOVEMENT in (mm)									
Lowest position	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)
Top of timed range	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)
Highest position	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)
LOAD CG MOVEMENT in (mm)									
Lowest position	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)
Top of timed range	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)
Highest position	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	5000 (20600)	4000 (15875)	3000 (11930)	2000 (7937)	1500 (5953)	1000 (3969)	750 (2976)	500 (1984)	250 (992)
Location	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet	remote outlet
Hydraulic oil temperature °F (°C)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)	121 (49)
Location	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet	pump outlet
Maximum Lift Capacity	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)
Lift Capacity for Transport	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)
QUICK ATTACH CATEGORY	II	II	II	II	II	II	II	II	II
LOAD lbs (kg)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)	4408 (1999)
TIME sec	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
HITCH POINT MOVEMENT in (mm)									
Lowest position	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)	9.8 (249)
Top of timed range	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)	55.9 (861)
Highest position	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)	36.8 (935)
LOAD CG MOVEMENT in (mm)									
Lowest position	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)	11.8 (300)
Top of timed range	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)	35.0 (889)
Highest position	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)	30.0 (762)

*Implement load capacity for transport purposes not specified by manufacturer.
 ** The observed maximum pressure was outside the range specified by the manufacturer: 2700-2900 psi (186.2-200.0 kPa).



Hitch Dimensions as Tested — No Load

	inch	mm
A	21.9	556
B	12.4	315
C	20.4	519
D	19.7	500
E	17.4	441
F	0.0	0
G	25.5	648
H	4.7	119
I	15.8	401
J	25.5	648
K	21.7	550
L	37.4	950
M	20.9	531
N	37.4	950
O	8.0	203
P	44.5	1130
Q	36.6	930
R	22.0	559

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power test, the fuel temperature at the injection pump was maintained at 133°F (56.4°C). Twelve travel speeds were chosen up to 10 mph (16.1 km/h). The pull in the 1st range was limited by the setting of the hydrostatic transmission pressure relief valve.

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1565, June 21, 1985.

LOUIS I. LEVITICUS

Engineer-in-Charge

K. VON BARGEN

L. L. BASHFORD

T. L. THOMPSON

Board of Tractor Test Engineers

LUGGING ABILITY FROM SPEED SETTING 5.6 MPH 1ST RANGE

Cranks/Min Speed rpm	2501	2250	2001	1749	1500	1248
Pull—lbs	4742	5580	5497	6180	6517	5689
in	21.09	27.91	28.21	27.49	29.10	29.11
Increase in Pull %	0	15	24	30	35	20
Power—hp	70.91	70.41	66.99	60.72	55.05	40.37
in	32.66	32.60	49.44	47.28	39.54	30.11
Speed—mph	5.61	4.91	4.26	3.68	3.15	2.66
in	19.02	17.90	16.86	15.45	14.07	14.28
Slip %	3.81	4.56	5.17	5.54	5.78	5.05

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours	80.5
75% of Pull at Maximum Power—Two Hours	81.0
50% of Pull at Maximum Power—Two Hours	79.5
50% of Pull at Reduced Engine Speed—Two Hours	80.0
Breaker in 2nd range	90.0

TIRE BALLAST AND WEIGHT

Ballast	With Ballast	Without Ballast
Ballast	Two 16.9-20, 5, 18 (125)	Two 16.9-20, 5, 18 (125)
Ballast	300 lb (136 kg)	None
Ballast	None	None
Front Tires	Two 16.9-20, 5, 18 (125)	Two 16.9-20, 5, 18 (125)
Ballast	400 lb (181 kg)	None
Ballast	None	None
Height of Drawbar	18 in (457 mm)	18 in (457 mm)
Static Weight with Operator—Rear	4000 lb (1818 kg)	4000 lb (1818 kg)
—Front	3000 lb (1361 kg)	3000 lb (1361 kg)
—Total	7000 lb (3179 kg)	7000 lb (3179 kg)

Agricultural Research Division
 Institute of Agriculture and Natural Resources
 University of Nebraska-Lincoln
 Irvin T. Ostved, Dean and Director



Verantile 276 Diesel

NEBRASKA TRACTOR TEST 1566—VERSATILE 836 MANUAL DIESEL 15 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (L/hr)	Brake hp (kW)	Hp-hr/gal (L/kWh)	Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed—1000 rpm)								
192.54 (141.38)	2100 (141.38)	10.870 (41.140)	0.994 (0.240)	17.71 (1.950)	180 (82.3)	65 (18.3)	75 (23.0)	28.97 (97.82)

Reduced Engine Speed — One Hour (PTO Speed—800 rpm)								
197.18 (147.03)	1799 (129.427)	10.416 (39.427)	0.969 (0.224)	18.93 (1.730)	182 (82.2)	66 (19.0)	75 (23.1)	28.83 (97.34)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

170.54 (127.17)	2187 (158.187)	10.196 (38.187)	0.617 (0.254)	16.73 (1.285)	179 (81.7)	67 (19.2)	75 (23.6)	—
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0.00 (0.00)	2528 (182.432)	5.284 (19.649)	—	—	177 (80.6)	66 (18.8)	75 (23.6)	—
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88.19 (65.76)	2262 (166.849)	7.095 (26.449)	0.561 (0.141)	12.45 (1.244)	178 (81.1)	67 (19.4)	76 (24.2)	—
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192.77 (143.75)	2101 (152.75)	11.181 (42.121)	0.405 (0.246)	17.24 (1.386)	181 (82.5)	68 (19.7)	77 (23.0)	—
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44.82 (33.42)	2289 (168.489)	4.879 (18.489)	0.760 (0.492)	9.19 (1.830)	178 (80.8)	67 (19.4)	75 (23.0)	—
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150.92 (112.62)	2235 (163.608)	8.825 (33.608)	0.470 (0.286)	14.85 (1.922)	179 (81.7)	68 (19.7)	75 (23.6)	—
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Ar 104.54 Ac (77.83)	2254 (166.679)	7.576 (28.679)	0.506 (0.300)	15.80 (2.718)	179 (81.6)	67 (19.6)	75 (24.0)	28.92 (97.63)
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DRAWBAR PERFORMANCE AT 2100 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Sip %	Fuel Consumption gal/hr (L/hr)	Brake hp (kW)	Hp-hr/gal (L/kWh)	Cooling medium	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
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Maximum Available Power — Two Hours 9th (2-4) Gear											
166.62 (124.25)	11276 (50.18)	5.54 (8.82)	2099 (152.75)	9.25 (40.66)	10.609 (0.272)	15.50 (1.071)	183 (81.6)	50 (14.7)	72 (22.2)	28.85 (97.42)	—

75% of Pull at Maximum Power — Ten Hours 9th (2-4) Gear											
154.90 (100.60)	8627 (38.66)	5.86 (9.44)	2202 (160.40)	2.47 (16.189)	9.560 (0.301)	0.495 (2.780)	14.11 (81.6)	183 (13.7)	69 (20.6)	29.01 (97.96)	—

50% of Pull at Maximum Power — Two Hours 9th (2-4) Gear											
92.57 (68.03)	5752 (25.59)	6.05 (9.71)	2247 (166.03)	1.69 (29.215)	7.725 (0.374)	0.582 (2.361)	11.99 (81.6)	183 (13.7)	60 (21.6)	28.97 (97.43)	—

50% of Pull at Reduced Engine Speed — Two Hours 11th (3-2) Gear											
92.67 (68.10)	5752 (25.59)	6.04 (9.72)	1511 (110.40)	1.69 (21.646)	5.724 (0.262)	0.433 (1.889)	18.19 (81.3)	186 (13.8)	61 (23.3)	28.96 (97.79)	—

MAXIMUM POWER IN SELECTED GEARS

157.28 (102.37)	24125 (107.30)	2.15 (3.43)	2172 (158.187)	14.78 (11.41)	5th (1-5) Gear	182 (81.3)	50 (10.0)	54 (12.2)	28.97 (97.83)	—
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150.15 (111.97)	25774 (107.35)	2.37 (3.81)	2101 (152.75)	14.29 (11.41)	4th (1-4) Gear	183 (81.6)	54 (12.2)	60 (15.6)	28.99 (97.89)	—
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161.51 (120.29)	26.16 (89.03)	5.02 (4.86)	2100 (152.75)	8.02 (14.86)	5th (1-5) Gear	182 (81.1)	60 (17.8)	75 (23.0)	28.84 (97.39)	—
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164.96 (123.01)	17912 (78.67)	5.45 (8.56)	2100 (152.75)	6.51 (15.56)	6th (2-1) Gear	182 (81.3)	60 (15.6)	75 (23.0)	28.84 (97.39)	—
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169.78 (126.61)	17485 (126.61)	4.01 (6.45)	2097 (152.75)	5.20 (8.45)	7th (2-2) Gear	185 (83.6)	60 (15.6)	75 (23.0)	28.85 (97.42)	—
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170.56 (127.18)	15245 (112.81)	4.83 (7.77)	2101 (152.75)	3.92 (6.45)	8th (2-3) Gear	185 (81.9)	60 (15.6)	74 (23.3)	28.86 (97.46)	—
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170.08 (126.83)	11505 (81.17)	5.54 (8.82)	2100 (152.75)	3.25 (5.30)	9th (2-4) Gear	185 (81.9)	59 (15.0)	75 (22.8)	28.85 (97.42)	—
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166.57 (124.21)	9428 (69.94)	6.65 (10.66)	2100 (152.75)	2.60 (4.19)	10th (2-5) Gear	184 (84.2)	60 (15.6)	74 (23.3)	28.86 (97.46)	—
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166.71 (124.32)	7454 (53.07)	8.41 (13.53)	2101 (152.75)	1.89 (3.07)	11th (3-1) Gear	183 (81.6)	60 (15.6)	75 (22.8)	28.85 (97.42)	—
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Department of Agricultural Engineering

Date of Test: May 16 to 28, 1985

Manufacturer: VERSATILE FARM EQUIPMENT COMPANY, 1260 Clarence Avenue, Winnipeg, Manitoba Canada R5T 1T3

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8582 Fuel weight 6.979 lb/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 6.425 gal (24.315 l) Drained from motor 5.921 gal (22.414 l) Transmission and hydraulic lubricant Versatile HyGear 23 or equivalent Final drive lubricant SAE 85W/140 Total time engine was operated 47.5 hours.

ENGINE: Make Cummins Diesel Type six cylinder vertical with turbocharger Serial No. 54515051 Crankshaft lengthwise Rated rpm 1750 to 2100 Bore and stroke 4.921" x 5.354" (125 mm x 136 mm) Compression ratio 16.0 to 1 Displacement 611 cu in (10010 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge and one bypass cartridge Oil cooler engine coolant heat exchanger for crankcase oil radiator for hydraulic and transmission oil Fuel filter one paper cartridge Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive with duals Serial No. 836 85 215121 Trend width rear 62" (1575 mm) to 120.1" (3050 mm) front 62" (1575 mm) to 120.1" (3050 mm) Wheel base 129.9" (3290 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 74.5" (1887 mm) Vertical distance above roadway 41" (1041 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.8 (2.8) second 2.0 (3.2) third 2.3 (3.7) fourth 2.5 (4.0) fifth 3.3 (5.3) sixth 3.7 (5.9) seventh 4.2 (6.8) eighth 5.0 (8.1) ninth 5.7 (9.2) tenth 6.8 (10.9) eleventh 8.6 (13.8) twelfth 9.8 (15.8) thirteenth 11.7 (18.8) fourteenth 13.3 (21.4) fifteenth 15.8 (25.4) reverse 2.7 (4.4), 3.1 (5.0), 3.7 (6.0), 4.2 (6.8), 5.0 (8.1) Clutch multiple wet disc operated by foot pedal Brakes caliper disc hydraulically actuated by foot pedal Steering hydrostatic and articulated Turning radius (on concrete surface without brake) right 256" (5.99 m) left 256" (5.99 m) Turning space diameter (on concrete surface without brake) right 590" (12.45 m) left 490" (12.45 m) Power take-off 1008-rpm at 2100 engine rpm Unladen tractor mass 24480 lb (11104 kg).

LUGGING ABILITY IN 9th (3-4) GEAR

Crankshaft Speed rpm	2100	1800	1677	1471	1254	1090
Pull—lb (kN)	11505 (51.17)	13529 (59.29)	14525 (64.60)	15743 (70.03)	16515 (73.45)	15956 (70.89)
Increase in Pull %	0	16	26	37	44	59
Power—Hp (kW)	170.08 (126.87)	175.81 (131.10)	189.33 (138.27)	180.04 (133.14)	142.50 (106.12)	115.21 (85.91)
Speed—Mph (km/h)	5.54 (8.92)	4.95 (7.96)	4.37 (7.04)	3.81 (6.14)	3.25 (5.20)	2.71 (4.36)
Sip %	5.25	4.07	4.38	4.96	5.72	5.30

TRACTOR SOUND LEVEL WITH CAB			
1750 RPM	1900 RPM	2100 RPM	
dB(A)	dB(A)	dB(A)	
Maximum Available Power—Two Hours	77.0	79.0	84.0
75% of Pull at Maximum Power—Ten Hours	—	—	80.0
50% of Pull at Maximum Power—Two Hours	—	—	81.0
50% of Pull at Reduced Engine Speed—Two Hours	—	—	74.0
bystander in 15th (3-5) gear	—	—	92.0

DRAWBAR PERFORMANCE AT 1900 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Sip %	Fuel Consumption gal/hr (L/hr)	Brake hp (kW)	Hp-hr/gal (L/kWh)	Cooling medium	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
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Maximum Available Power — Two Hours 9th (2-4) Gear											
172.66 (128.75)	15066 (67.85)	4.98 (8.01)	1900 (139.75)	4.11 (19.73)	10.496 (0.258)	0.424 (1.241)	16.45 (81.6)	184 (13.8)	57 (21.6)	67 (19.4)	28.99 (97.89)

(128.75)	(57.85)	(8.01)	(39.73)	(0.258)	(3.242)	(96.4)	(23.9)	(19.4)	(97.89)
MAXIMUM POWER IN SELECTED GEARS									

175.81 (131.10)	15257 (68.88)	4.98 (8.02)	1898 (139.75)	3.92 (19.73)	9th (2-4) Gear	185 (83.6)	59 (15.0)	75 (22.8)	28.85 (97.42)	—
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DRAWBAR PERFORMANCE AT 1750 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Sip %	Fuel Consumption gal/hr (L/hr)	Brake hp (kW)	Hp-hr/gal (L/kWh)	Cooling medium	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
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Maximum Available Power — Two Hours 9th (2-4) Gear											
169.34 (126.28)	15901 (61.81)	4.57 (7.35)	1749 (126.28)	4.26 (17.84)	10.025 (0.251)	0.415 (1.328)	16.90 (81.3)	186 (13.8)	59 (15.0)	75 (22.8)	29.00 (97.91)

(126.28)	(61.81)	(7.11)	(37.94)	(0.251)	(3.128)	(85.3)	(75.0)	(22.8)	(97.9)	
MAXIMUM POWER IN SELECTED GEARS										

171.76 (128.08)	14084 (62.65)	4.57 (7.36)	1750 (126.28)	4.22 (17.84)	9th (2-4) Gear	185 (83.6)	59 (15.0)	75 (22.8)	28.85 (97.42)	—
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TIRES, BALLAST AND WEIGHT

Rear Tires	—No. size, ply & psi (kPa)	With Ballast	Without Ballast
Ballast	—Liquid (each inner): —Cast Iron (each):	Four 18.4-58, 8, inner 34 (95) outer 12 (85) 303 lb (136 kg) None	Four 18.4-58, 8, inner 34 (95) outer 12 (85) None
Front Tires	—No. size, ply & psi (kPa)	Four 18.4-58, 8, inner 34 (95) outer 12 (85) 345 lb (157 kg) None	Four 18.4-58, 8, inner 34 (95) outer 12 (85) None
Weight of Operator	—	18 in (457 mm)	18 in (457 mm)
Static Weight with Operator—Rear	—Front	11770 lb (5347 kg) 14790 lb (6709 kg) 23960 lb (10878 kg)	10560 lb (4790 kg) 14100 lb (6396 kg) 24660 lb (11189 kg)

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Irvin T. Omirved, Dean and Director

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 121°F (49.5°C). Nine gears were chosen between 15% slip and 10 mph (16.1 km/h). During the drawbar tests, the alternator belt guard bracket supports broke. A considerable amount of oil leaked from the valve block during the hydraulic lift test.

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1566, June 21, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers

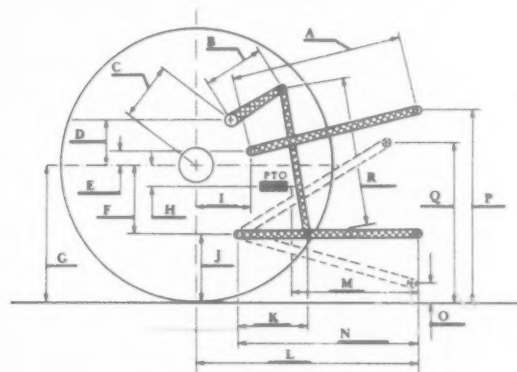
THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2550 (17580)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	152 (56)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	yes	
CATEGORY	IV	*not measured
LOAD lbs (kg)	12744 (5787)	
TIME sec	4.15	
HITCH POINT MOVEMENT in (mm)		
Lowest position	15.8 (351)	
Top of timed range	45.8 (1113)	
Highest position	45.9 (1115)	
LOAD CG MOVEMENT in (mm)		
Lowest position	13.2 (335)	
Top of timed range	50.1 (1277)	
Highest position	50.4 (1280)	

*Implement load capacity for transport purposes not specified by manufacturer

**The observed maximum pressure was outside the range specified by the manufacturer: 2400-2500 psi (16550-17240 kPa)

***The manufacturer's claimed capacity was 21700 lbs (9840 kg)



Hitch Dimensions as Tested — No Load

	inch	mm
A	27.4	695
B	18.6	472
C	20.3	516
D	19.0	483
E	12.6	319
F	10.4	263
G	51.4	1298
H	1.7	44
I	25.7	652
J	21.0	533
K	25.0	635
L	55.4	1356
L'	59.9	1521
M	27.9	708
N	45.0	1092
O	8.0	203
P	48.0	1219
Q	42.0	1067
R	32.6	829

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Versatile 836 Manual Diesel

NEBRASKA TRACTOR TEST 1567—VERSATILE 836 POWERSHIFT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature (°C)			Barometer inch Hg (kPa)
		gal/hr (kg)	lb/hr (kg)	Hp/hr/gal (kW/kg)	Cooling medium wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed — Two hours (PTO Speed—997 rpm)							
181.04 (135.00)	2100	10.875 (41.134)	0.419 (0.215)	16.63 (3.204)	182 (83.5)	63 (17.0)	28.91 (97.62)
Reduced Engine Speed — One hour (PTO Speed—831 rpm)							
185.62	1795	10.295	0.587	18.03	184	63	28.92

VARYING POWER AND FUEL CONSUMPTION — Two Hours							
160.02 (119.33)	2183	10.228 (38.717)	0.446 (0.271)	15.65 (7.082)	140 (62)	64 (17.8)	76 (24.2)
0.00 (0.00)	2322	5.676 (13.915)	—	—	177 (80.6)	62 (16.7)	72 (22.2)
82.61 (61.61)	2260	7.599 (28.008)	0.625 (0.382)	11.17 (2.200)	179 (81.7)	64 (17.5)	75 (23.6)
181.20 (135.12)	2100	11.212 (42.441)	0.432 (0.263)	16.16 (7.184)	185 (83.6)	64 (17.8)	75 (23.9)
41.85 (31.21)	2288	5.245 (19.855)	0.875 (0.532)	7.98 (1.572)	177 (80.6)	63 (17.2)	74 (23.1)
122.46 (91.32)	2227	9.076 (34.155)	0.517 (0.315)	13.49 (2.658)	180 (81.9)	64 (17.8)	75 (23.6)
Av (73.18)	2230	7.806 (29.549)	0.536 (0.330)	12.56 (2.474)	179 (81.8)	63 (17.5)	74 (23.4)

DRAWBAR PERFORMANCE AT 2100 RPM

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank shaft speed rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Temp. °F (°C)	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
Maximum Available Power — Two Hours 7th Gear									
158.51 (118.05)	10765 (47.89)	5.51 (8.87)	2101 (8.87)	2.71 (0.696)	0.472 (0.281)	14.80 (6.915)	183 (83.9)	70 (15.3)	28.75 (97.02)
75% of Pull at Maximum Power — Ten Hours 7th Gear									
127.01 (94.71)	8204 (36.49)	5.81 (9.34)	2191 (8.87)	1.82 (0.466)	0.523 (0.267)	15.54 (7.051)	183 (83.9)	70 (15.3)	28.44 (96.02)
50% of Pull at Maximum Power — Two Hours 7th Gear									
86.91 (64.81)	5470 (24.33)	5.96 (9.59)	2230 (8.87)	1.08 (0.267)	0.621 (0.318)	11.24 (2.215)	182 (81.3)	74 (15.3)	28.61 (96.59)
50% of Pull at Reduced Engine Speed — Two Hours 10th Gear									
86.90 (64.80)	5472 (24.34)	5.96 (9.58)	1224 (8.87)	1.12 (0.272)	0.447 (0.215)	15.61 (7.075)	184 (84.2)	65 (17.2)	28.77 (97.15)

MAXIMUM POWER IN SELECTED GEARS

154.54 (110.32)	24725 (109.97)	2.04 (3.28)	2151 (8.87)	14.72 (5.28)	2nd Gear	180 (82.2)	54 (12.2)	64 (17.8)	28.70 (96.92)
148.06 (110.41)	20850 (92.75)	2.66 (4.29)	2099 (8.87)	7.47 (5.32)	3rd Gear	181 (82.6)	56 (13.3)	67 (19.4)	28.75 (97.02)
157.19 (119.91)	17825 (79.28)	5.51 (8.87)	2099 (8.87)	5.74 (5.32)	4th Gear	184 (84.4)	72 (22.2)	83 (28.3)	28.62 (96.65)
160.81 (119.91)	14655 (65.18)	4.12 (6.62)	2099 (8.87)	4.02 (6.62)	5th Gear	184 (84.4)	71 (21.7)	81 (27.2)	28.65 (96.68)
156.54 (116.36)	11515 (51.22)	5.09 (8.19)	2099 (8.87)	5.02 (8.19)	6th Gear	184 (84.4)	71 (21.7)	81 (27.2)	28.62 (96.65)
160.71 (119.84)	10939 (48.96)	5.51 (8.87)	2099 (8.87)	2.86 (8.87)	7th Gear	184 (84.2)	69 (20.6)	79 (26.1)	28.62 (96.65)
161.45 (120.19)	8940 (39.77)	6.77 (10.90)	2097 (8.87)	2.16 (10.90)	8th Gear	183 (81.9)	70 (21.1)	81 (27.2)	28.62 (96.65)
155.26 (114.29)	6895 (30.66)	8.54 (13.42)	2099 (8.87)	1.52 (13.42)	9th Gear	184 (84.2)	71 (21.7)	81 (27.2)	28.62 (96.65)

Department of Agricultural Engineering

Dates of Test: May 7 to 31, 1985

Manufacturer: VERSATILE FARM EQUIPMENT COMPANY, 1260 Clarence Avenue, Winnipeg, Manitoba, Canada R3T 1T3

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.3 (rating taken from oil company's inspection data) Specific gravity converted to 60°F (15.1°C) 0.8381 Fuel weight 6.978 lb/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 6.528 gal (24.71 l) Drained from motor 5.748 gal (21.75 l) Transmission lubricant Mobil Delvac 1350 Final drive lubricant SAE 85W/140 Total time engine was operated 45.0 hours.

ENGINE: Make Cummins Diesel Type six cylinder vertical with turbocharger Serial No. 54514251 Crankshaft lengthwise Rated rpm 1750 to 2100 Bore and stroke 4.921" x 5.554" (125 mm x 136 mm) Compression ratio 16.0 to 1 Displacement 611 cu in (10010 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge and one bypass cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter one paper cartridge Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive with dual Serial No. 856 85 217104 Tread width rear 62" (1575 mm) to 120.1" (3050 mm) from 62" (1575 mm) to 120.1" (3050 mm) Wheel base 129.9" (3300 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 74.0" (1880 mm) Vertical distance above roadway 41" (1041 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with full range operator controlled powershift Advertised speeds mph (km/h) first 1.9 (3.1) second 2.4 (3.8) third 2.9 (4.6) fourth 3.5 (5.6) fifth 4.3 (6.9) sixth 5.2 (8.4) seventh 5.7 (9.1) eighth 6.9 (11.2) ninth 8.4 (13.6) tenth 10.3 (16.6) eleventh 12.6 (20.2) twelfth 15.4 (24.8) reverse 2.3 (3.7), 2.8 (4.5), 3.4 (5.5) Clutch multiple wet disc hydraulically power actuated and operated by foot pedal Brakes caliper disc hydraulically actuated by foot pedal Steering hydrostatic and articulated Turning radius (on concrete surface without brake) right 236" (5.99 m) left 236" (5.99 m) Turning space diameter (on concrete surface without brake) right 490" (12.45 m) left 490" (12.45 m) Power take-off 997 rpm at 2100 engine rpm Unladen tractor mass 24280 lb (11013 kg).

LUGGING ABILITY IN 7th GEAR

Crankshaft Speed rpm	2099	1885	1685	1475	1255	1046
Pull—lb (kN)	10959 (48.66)	12599 (56.04)	13798 (61.38)	15068 (67.03)	15997 (71.16)	15027 (66.84)
Increase in Pull %	0	15	26	38	46	57
Power—Hp (kW)	160.71 (119.84)	165.51 (121.27)	160.89 (119.97)	152.92 (114.04)	137.73 (100.73)	108.11 (80.62)
Speed—Mph (km/h)	5.51 (8.87)	4.92 (7.92)	4.57 (7.04)	3.81 (6.12)	3.25 (5.20)	2.70 (4.34)
Slip %	2.86	3.41	3.87	4.32	4.65	4.48

TRACTOR SOUND LEVEL WITH CAB

	1750 RPM	1900 RPM	2100 RPM
	dB(A)	dB(A)	dB(A)
Maximum Available Power—Two Hours	79.5	77.5	79.5
75% of Pull at Maximum Power—Ten Hours			79.5
50% of Pull at Maximum Power—Two Hours			79.0
50% of Pull at Reduced Engine Speed—Two Hours			71.5
Bystander in 12th gear			91.5

DRAWBAR PERFORMANCE AT 1900 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crankshaft speed rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Temp. °F (°C)	Cond. mg med	Air wet bulb (°F)	Air dry bulb (°F)	Barom. inch Hg (kPa)
164.91 (122.80)	12454 (55.40)	4.97 (7.99)	1900	5.18	10.497 (39.737)	0.444 (1.095)	15.71 (83.9)	62 (16.7)	73 (21.4)	28.78 (97.19)

MAXIMUM POWER IN SELECTED GEAR

167.47 (124.88)	12541 (56.27)	4.97 (8.00)	1901	5.18	7th Gear	185 (83.9)	62 (16.7)	74 (21.4)	28.78 (97.19)
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DRAWBAR PERFORMANCE AT 1750 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crankshaft speed rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Temp. °F (°C)	Cond. mg med	Air wet bulb (°F)	Air dry bulb (°F)	Barom. inch Hg (kPa)
162.11 (120.85)	13545 (60.56)	4.56 (7.33)	1749	5.68	10.005 (37.607)	0.451 (1.026)	16.21 (81.9)	62 (16.7)	76 (24.4)	28.78 (97.17)

MAXIMUM POWER IN SELECTED GEAR

165.05 (121.08)	13577 (60.78)	4.56 (7.34)	1750	5.56	7th Gear	185 (83.9)	62 (16.7)	76 (24.4)	28.77 (97.15)
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TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires	Four 18.4-38, 8 inner 14 (95) outer 12 (85)	Four 18.4-38, 8 inner 14 (95) outer 12 (85)
Ballast	—Liquid (each inner) 262 lb (119 kg) —Cast Iron (each) None	None
Front Tires	Four 18.4-38, 8 inner 14 (95) outer 12 (85)	Four 18.4-38, 8 inner 14 (95) outer 12 (85)
Ballast	—Liquid (each inner) 505 lb (229 kg) —Cast Iron (each) None	None
Height of Drawbar	18 in (457 mm)	18 in (457 mm)
Static Weight with Operator—Rear	11055 lb (5014 kg)	10550 lb (4776 kg)
—Front	14940 lb (6777 kg)	13950 lb (6319 kg)
—Total	25995 lb (11791 kg)	24500 lb (11095 kg)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 120°F (48.8°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h). Following the rTO test, one of the alternator belt guard bracket supports was found broken.

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1567, June 21, 1985.

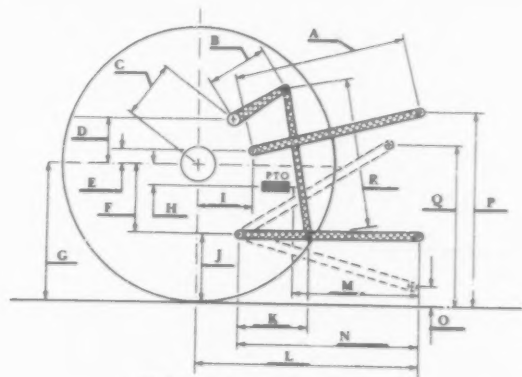
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	** 2575 (17750)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	121 (49)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	YES	
CATEGORY	IV	*not measured
LOAD lbs (kg)	*** 12744 (5781)	
TIME sec	3.82	
HITCH POINT MOVEMENT in (mm)		
Lowest position	14.0 (356)	
Top of timed range	44.0 (1118)	
Highest position	44.6 (1133)	
LOAD CG MOVEMENT in (mm)		
Lowest position	13.7 (348)	
Top of timed range	50.3 (1278)	
Highest position	51.7 (1313)	

*Implement load capacity for transport purposes not specified by manufacturer.
**The observed maximum pressure was outside the range specified by the manufacturer: 2400-2500 psi (16550-17240 kPa).
***The manufacturer's claimed capacity was 21700 lb (9840 kg).



Hitch Dimensions as Tested — No Load

	inch	mm
A	28.0	711
B	18.6	472
C	20.3	516
D	19.0	483
E	12.6	319
F	10.4	263
G	31.2	791
H	1.7	44
I	25.7	652
J	20.8	527
K	25.0	635
L	53.4	1356
M	59.9	1521
N	27.9	708
O	43.0	1092
P	47.8	1213
Q	42.1	1070
R	32.5	826

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Versatile 836 Powershift Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Irvin T. Ostwald, Dean and Director

NEBRASKA TRACTOR TEST 1568—VERSATILE 856 POWERSHIFT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)			
		gal/hr (lit)	lb/gal (kg/m ³)	Hg for gal (48.5)	Consum medium	Air wet bulb	Air dry bulb	Barometer in/hg (kPa)

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed — Two hours (PTO Speed—897 rpm)

209.28	2100	12.139	0.405	17.24	182	65	75	28.75
(156.86)		(47.412)	(12.246)	(17.740)	(47.5)	(18.5)	(27.4)	(107.02)

Reduced Engine Speed — One hour (PTO Speed—851 rpm)

208.55	1785	11.271	0.378	18.48	185	64	75	28.70
(155.76)		(42.666)	(11.230)	(17.442)	(48.0)	(17.7)	(24.3)	(106.92)

VARYING POWER AND FUEL CONSUMPTION — Two Hours

180.17	2100	11.479	0.450	16.21	180	65	76	
(134.76)		(43.472)	(12.262)	(17.246)	(48.2)	(17.2)	(27.4)	

180.00	2545	9.636		17.4	64	75		
(134.66)		(36.746)		(17.9)	(17.8)	(27.4)		

96.54	2280	8.095	0.585	11.95	177	64	77	
(71.86)		(30.647)	(17.556)	(12.549)	(48.0)	(17.5)	(27.4)	

210.26	2100	12.446	0.415	16.89	185	65	76	
(158.76)		(47.118)	(12.251)	(17.526)	(48.3)	(18.3)	(27.4)	

48.77	2510	5.744	0.422	8.85	175	65	74	
(36.37)		(21.741)	(12.546)	(11.673)	(24.6)	(18.3)	(27.4)	

142.57	2245	10.112	0.406	14.08	179	66	76	
(106.17)		(38.277)	(12.214)	(17.44)	(48.4)	(19.9)	(29.2)	

At 114.81	2245	8.622	0.328	15.22	178	64	75	28.85
(85.82)		(32.636)	(9.924)	(12.469)	(48.3)	(17.8)	(24.3)	(106.86)

DRAWBAR PERFORMANCE AT 2100 RPM

DRAWBAR PERFORMANCE AT 2100 RPM									
Power Hhp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Fuel Consumption gal/hr (liters/hr)	Temp. °F (°C)	Rev. min/hr	Accel. sec/ft (m/s)	Rev. min/hr	Accel. sec/ft (m/s)	Rev. min/hr
182.42	11058	5.80	11.001	0.455	15.35	181	55	65	28.85
(134.83)	(49.77)	(9.46)	(41.995)	(12.277)	(15.625)	(48.6)	(12.5)	(18.9)	(107.35)

Maximum Available Power — Two Hours 7th Gear

182.42	11058	5.80	11.001	0.455	15.35	181	55	65	28.85
(134.83)	(49.77)	(9.46)	(41.995)	(12.277)	(15.625)	(48.6)	(12.5)	(18.9)	(107.35)

75% of Pull at Maximum Power — Two Hours 7th Gear

147.55	8830	6.25	10.934	0.515	15.39	181	54	55	28.54
(110.02)	(39.87)	(10.06)	(41.087)	(12.522)	(15.678)	(48.5)	(12.5)	(18.9)	(106.56)

50% of Pull at Maximum Power — Two Hours 7th Gear

100.95	5100	6.41	10.958	0.612	11.40	178	55	54	28.74
(75.26)	(22.75)	(10.32)	(41.525)	(12.572)	(12.245)	(48.3)	(12.5)	(18.9)	(107.05)

25% of Pull at Maximum Power — Two Hours 7th Gear

101.91	5400	6.42	15.19	1.78	6.515	14.81	180	54	55	28.67	
(77.52)	(24.25)	(10.35)			(26.175)	(12.291)	(12.878)	(48.2)	(12.5)	(12.8)	(106.86)

MAXIMUM POWER IN SELECTED GEARS

156.65	26479	2.22	21.76	14.76	2nd Gear	179	55	56	28.92
(116.85)	(121.78)	(3.65)				(48.7)	(12.5)	(19.4)	(107.66)

175.49	25288	2.85	20.98	7.46	3rd Gear	180	54	60	28.95
(130.67)	(102.76)	(4.55)				(48.2)	(12.5)	(17.8)	(107.26)

189.55	19406	5.55	20.99	5.26	4th Gear	180	50	56	28.82
(140.87)	(88.12)	(9.35)				(48.2)	(12.5)	(17.8)	(107.26)

184.96	15711	8.59	20.99	5.94	5th Gear	173	50	56	28.82
(137.26)	(70.88)	(12.87)				(48.3)	(12.5)	(17.8)	(107.26)

175.75	12141	5.45	21.00	5.00	6th Gear	181	50	57	28.82
(131.86)	(54.83)	(9.78)				(48.5)	(12.5)	(17.8)	(107.26)

185.04	11810	5.84	21.00	2.85	7th Gear	181	52	58	28.85
(137.86)	(52.51)	(9.46)				(48.5)	(12.5)	(18.9)	(107.35)

185.19	9122	7.21	20.98	2.25	8th Gear	180	50	57	28.82
(138.56)	(42.35)	(12.45)				(48.2)	(12.5)	(17.8)	(107.26)

178.11	7921	8.87	20.99	1.85	9th Gear	180	52	58	28.85
(132.86)	(32.51)	(14.27)				(48.2)	(12.5)	(18.9)	(107.35)

Department of Agricultural Engineering

Date of Test: May 4 to 16, 1985

Manufacturer: VERSATILE FARM EQUIPMENT COMPANY, 1260 Clarence Avenue, Winnipeg, Manitoba, Canada R3T 1T3

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15.12°C) 0.8581 Fuel weight 6.978 lb/gal (0.816 kg/l) Oil SAE 15W-40 API service classification SE, SE, CC, CD To motor 0.091 gal (25.329 l) Drained from motor 5.249 gal (19.869 l) Transmission lubricant Mobil Delvac 1350 Final drive lubricant SAE 85W140 Total time engine was operated 50.5 hours.

ENGINE: Make Cummins Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. 34314049 Crankshaft lengthwise Rated rpm 1750 to 2100 Bore and stroke 4.921" x 5.554" (125 mm x 141 mm) Compression ratio 16.0 to 1 Displacement 611 cu in (10010 cc) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and separator Oil filter one full cartridge and one bypass cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter one paper cartridge Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive with dual Serial No. 856-85 221045 Tread width rear 72" (1830 mm) to 128" (3250 mm) front 72" (1830 mm) to 128" (3250 mm) Wheel base 129.9" (3290 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 73.7" (1871 mm) Vertical distance above roadway 41" (1041 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with full range operator controlled powershifts Advertised speeds mph (km/h) first 2.6 (3.2) second 2.4 (3.9) third 3.0 (4.8) fourth 3.6 (5.8) fifth 4.4 (7.1) sixth 5.4 (8.7) seventh 5.8 (9.4) eighth 7.1 (11.3) ninth 8.7 (14.0) tenth 10.6 (17.1) eleventh 13.0 (20.9) twelfth 15.9 (25.6) reverse 2.5 (3.8), 2.9 (4.6), 5.5 (8.8) Clutch multiple wet disc hydraulically power actuated and operated by foot pedal Brakes caliper disc hydraulically operated by foot pedal Steering hydrostatic and articulated Turning radius (on concrete surface without brake) right 259' (6.07 m) left 259' (6.07 m) Turning space diameter (on concrete surface without brake) right 490' (12.47 m) left 490' (12.47 m) Power take-off 996 rpm at 2100 engine rpm Unladen tractor mass 24900 lb (11291 kg).

LUGGING ABILITY IN 7th GEAR

Crankshaft Speed rpm	2100	1887	1679	1465	1246	1047
Pull—lb (kg)	11810 (5359)	13594 (6164)	14684 (6660)	15705 (7080)	16687 (7565)	15657 (7057)
Increase in Pull %	0	13	24	33	39	51
Power—hp (kW)	185.04 (137.96)	187.72 (139.96)	182.51 (134.20)	160.98 (120.75)	150.45 (112.27)	119.53 (88.96)
Speed—mph (km/h)	5.88 (9.46)	5.26 (8.46)	4.86 (7.80)	4.05 (6.52)	3.44 (5.55)	2.90 (4.66)
Slip %	2.85	3.55	5.65	5.82	4.14	5.82

TRACTOR SOUND LEVEL WITH CAB

Maximum Available Power—Two Hours	84.0	81.0	82.5
75% of Pull at Maximum Power—Two Hours			79.0
50% of Pull at Maximum Power—Two Hours			80.5
50% of Pull at Reduced Engine Speed—Two Hours			76.5
Reoperator in 12th gear			91.5

DRAWBAR PERFORMANCE AT 1900 RPM

TRACTOR PERFORMANCE AT 1500 RPM									
Power hp (kW)	Drawbar pull lb (kg)	Speed mph (km/h)	Crack shaft speed rpm	Slip %	Fuel Consumption gal/hr (liters/hr)	Temp. °F (°C)	Rev. min/hr	Accel. sec/ft (m/s)	Rev. min/hr
Maximum Available Power — Two Hours Test									
185.32 (138.28)	15150 (6841)	5.29 (8.52)	10800	3.20	11.515 (43.588)	16.09 (12.264)	182 (48.3)	56 (13.5)	66 (18.9)

MAXIMUM POWER IN SELECTED GEARS

188.17	13351	5.29	10.87	5.24	7th Gear	180	55	60	28.85
(140.52)	(59.26)	(8.52)				(48.2)	(12.5)	(17.8)	(107.26)

186.95	10762	6.51	10.81	2.06	8th Gear	181	51	58	28.82
(139.40)	(47.87)	(10.46)				(48.3)	(12.5)	(17.8)	(107.26)

DRAWBAR PERFORMANCE AT 1750 RPM

DRABLER PERFORMANCE AT 1750 RPM											
Power (hp)	Drawbar pull (lb)	Speed mph (km/h)	Comb. shaft speed rpm	Slop %	Fuel Consumption gal/hr (lit)	Hyd. P. to 400 psi (bar)	Case temp. °F (°C)	Air temp. °F (°C)	Rev. min/hr	Accel. sec/ft (m/s)	Rev. min/hr
Maximum Available Power — Two Hours 7th Gear											
181.22 (133.15)	13078 (59.26)	4.80 (7.82)	1743	5.55	11.065 (41.678)	0.426 (12.296)	183 (72.77)	56 (13.3)	67 (19.9)	67 (20.7)	28.84 (11.2)

MAXIMUM POWER IN SELECTED GEARS

185.75	14738	4.80	17.49	5.57	7th Gear	185	56	66	28.85
(137.86)	(66.87)	(7.82)				(48.6)	(12.5)	(18.9)	(107.35)

184.22	11540	5.99	17.50	2.75	8th Gear	182	51	58	28.85
(137.35)	(51.35)	(9.63)				(48.3)	(12.5)	(17.8)	(107.35)

TIRES, BALLAST AND WEIGHT

Rear Tire	—No. rear ply & psi (kPa)	With Ballast Rear 20.5-38, 8.00-16 14 (18) rear 12 (18)	Without Ballast Rear 20.5-38, 8.00-16 14 (18) rear 12 (18)
Ballast	—Largest track (mm)	950 lb (427 kg)	None
Front Tire	—No. front ply & psi (kPa)	Rear 20.5-38, 8.00-16 14 (18) rear 12 (18)	Rear 20.5-38, 8.00-16 14 (18) rear 12 (18)
Ballast	—Largest track (mm)	950 lb (427 kg)	None
Height of Drawbar		19.5 in (493 mm)	19.5 in (493 mm)
Rear Weight with Operator—lb (kg)	—Front	13025 lb (5909 kg)	13025 lb (5909 kg)
	—Total	26000 lb (11793 kg)	26000 lb (11793 kg)

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Irvin T. Omsvold, Dean and Director

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 112°F (44.4°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h). During the lift test, a retaining pin sheared. This did not affect the lift test.

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1568, June 20, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers

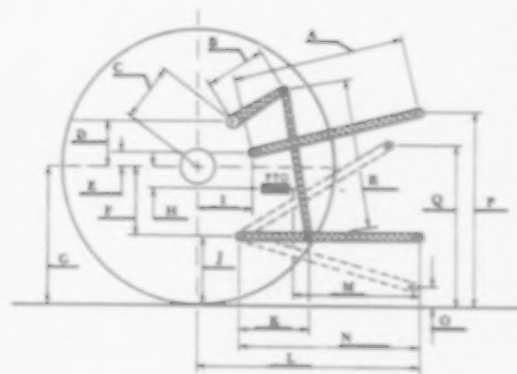
THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure (psi/MPa):	** 2525 (174.10)	
Location:	rearward roller	
Hydraulic oil temperature °F (°C):	129 (54)	
Location:	forward roller	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY:	III	
LOAD (lb/kg):	*** 13030 (591.2)	*Not measured
TIME (s):	8.08	
HITCH POINT MOVEMENT (in/mm):		
Lower position:	15.4 (391)	
Top of rated range:	45.4 (1127)	
Highest position:	44.0 (1118)	
LOAD CG MOVEMENT (in/mm):		
Lower position:	12.7 (323)	
Top of rated range:	49.2 (1250)	
Highest position:	45.9 (1166)	

*Maximum load capacity for transport purposes not specified by manufacturer.

**The observed maximum pressure was outside the range specified by the manufacturer, 2400-2500 psi (165.5-172.4 MPa).

***The manufacturer's claimed capacity was 13700 lb (6180 kg).



Hitch Dimensions as Tractor — No Load

	in/in	mm
A	27.6	702
B	18.0	457
C	20.5	518
D	19.0	481
E	12.5	318
F	10.4	263
G	55.5	1409
H	1.7	44
I	25.7	652
J	22.9	581
K	25.0	635
L	18.8	478
M	17.0	430
N	49.0	1245
O	8.0	203
P	49.0	1245
Q	42.0	1067
R	35.4	898

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Versatile 856 Powershift Diesel

NEBRASKA TRACTOR TEST 1569—VERSATILE 876 MANUAL DIESEL 12 SPEED

DRAWBAR PERFORMANCE AT 2100 RPM

Power (hp/kW)	Drawbar pull (lb/kN)	Speed (mph/km/h)	Creep (in/s)	Slip %	Test Conditions: Fuel Consumption (gal/hr/kg/hr)	Test Conditions: Fuel Consumption (gal/hr/kg/hr)	Temp °F (°C)	Test Conditions: Fuel Consumption (gal/hr/kg/hr)	Test Conditions: Fuel Consumption (gal/hr/kg/hr)
228.35 (167.27)	13110 (59.3)	8.55 (3.52)	2090 (8.7)	15.55 (6.4)	10.85 (4.1)	185 (81.8)	62 (16.7)	75 (19.4)	28.96 (11.2)
184.52 (136.75)	10875 (48.4)	8.87 (3.94)	2189 (8.7)	11.790 (4.5)	15.54 (5.8)	181 (82.5)	64 (15.7)	71 (17.2)	28.81 (11.2)
125.81 (92.16)	8217 (36.5)	10.17 (4.48)	2217 (8.8)	9.200 (3.4)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)
125.58 (92.05)	8216 (36.5)	10.17 (4.48)	2217 (8.8)	9.200 (3.4)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)

MAXIMUM POWER IN SELECTED GEARS

Power (hp/kW)	Drawbar pull (lb/kN)	Speed (mph/km/h)	Creep (in/s)	Slip %	Test Conditions: Fuel Consumption (gal/hr/kg/hr)	Test Conditions: Fuel Consumption (gal/hr/kg/hr)	Temp °F (°C)	Test Conditions: Fuel Consumption (gal/hr/kg/hr)	Test Conditions: Fuel Consumption (gal/hr/kg/hr)
204.16 (152.25)	17755 (79.2)	11.19 (4.9)	2119 (8.7)	14.76 (5.9)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)
221.96 (165.44)	14555 (65.2)	10.86 (4.8)	2189 (8.7)	14.76 (5.9)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)
228.82 (169.18)	10875 (48.4)	8.87 (3.94)	2189 (8.7)	11.790 (4.5)	15.54 (5.8)	181 (82.5)	64 (15.7)	71 (17.2)	28.81 (11.2)
232.75 (174.14)	18141 (81.4)	11.05 (4.9)	2189 (8.7)	14.76 (5.9)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)
232.51 (174.08)	15478 (69.5)	10.86 (4.8)	2189 (8.7)	14.76 (5.9)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)
235.92 (175.75)	15475 (69.5)	10.86 (4.8)	2189 (8.7)	14.76 (5.9)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)
236.12 (176.01)	15475 (69.5)	10.86 (4.8)	2189 (8.7)	14.76 (5.9)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)
237.70 (176.80)	15475 (69.5)	10.86 (4.8)	2189 (8.7)	14.76 (5.9)	15.53 (5.8)	180 (81.7)	67 (15.8)	79 (18.3)	28.90 (11.2)

LOADING ABILITY IN 7th (5-5) GEAR

Crackshaft Speed (rpm)	2090	2189	2217	2245	2254	2264
Power—hp (kW)	174.85 (128.7)	174.85 (128.7)	174.85 (128.7)	174.85 (128.7)	174.85 (128.7)	174.85 (128.7)
Drawbar pull (lb/kN)	174.85 (78.7)	174.85 (78.7)	174.85 (78.7)	174.85 (78.7)	174.85 (78.7)	174.85 (78.7)
Speed—mph (km/h)	8.55 (3.52)	8.87 (3.94)	9.19 (4.1)	9.51 (4.2)	9.83 (4.3)	10.15 (4.4)
Slip %	15.55 (6.4)	11.79 (4.5)	9.20 (3.4)	7.30 (2.8)	5.43 (2.1)	3.56 (1.4)

TRACTOR SOUND LEVEL WITH CAB	1750 RPM	1900 RPM	2100 RPM
Maximum Available Power—Two Hours	80.6	79.5	84.0
75% of Pull at Maximum Power—Two Hours			81.0
50% of Pull at Maximum Power—Two Hours			79.0
50% of Pull at Reduced Engine Speed—Two Hours			78.5
Boundary in 12th (7-4) gear			91.5

Department of Agricultural Engineering

Dates of Test: May 21 to 29, 1985

Manufacturer: VERSATILE FARM EQUIPMENT COMPANY, 1260 Clarence Avenue, Winnipeg, Manitoba, Canada R3T 1T5

FUEL, OIL AND TIME: Fuel No. 2 Diesel Common No. 48.3 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8581 Fuel weight 6.978 lb/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 6.771 gal (25.632 l) Drained from motor 6.091 gal (23.074 l) Transmission and hydraulic lubricant Versatile HyGear 23 or equivalent Pinad drive lubricant SAE 85W/140 Total time engine was operated 56.0 hours.

ENGINE: Make Cummins Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. 34512116 Crankshaft lengthwise Rated rpm 1750 to 2100 Bore and stroke 4.921" x 5.554" (125 mm x 136 mm) Compression ratio 16.0 to 1 Displacement 611 cu in (10010 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge and one bypass cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter one paper cartridge Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive with dual Serial No. 876 85 223177 Trend width rear 72" (1830 mm) to 128" (3250 mm) from 72" (1830 mm) to 128" (3250 mm) Wheel base 129.9" (3300 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center line of rear wheels 75.0" (1905 mm) Vertical distance above roadway 41" (1041 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advection speeds mph (km/h) first 2.7 (4.3) second 3.1 (5.0) third 3.5 (5.7) fourth 4.1 (6.7) fifth 4.8 (7.8) sixth 5.6 (9.0) seventh 6.5 (10.4) eighth 7.5 (12.1) ninth 9.4 (15.2) tenth 10.9 (17.6) eleventh 12.6 (20.2) twelfth 14.6 (23.5) reverse 3.4 (5.5), 4.0 (6.5), 4.6 (7.4), 5.4 (8.8) Clutch dual dry disc operated by foot pedal Brakes caliper disc hydraulically operated by foot pedal Steering hydrostatic and articulated Turning radius (on concrete surface without brake) right 259' (6.07 m) left 259' (6.07 m) Turning space diameter (on concrete surface without brake) right 490' (12.45 m) left 490' (12.45 m) Power take-off none Unladen tractor mass 24780 lb (11240 kg)

DRAWBAR PERFORMANCE AT 1900 RPM

Power hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Gears shift speed rpm	Slope %	Fuel Consumption gal/hr (lph)	Temp. °F (°C)	Barom. in. Hg (kPa)
						Cond. wet cool	Air dry bulb
Maximum Available Power — Two Hours 7th (5-3) Gear							
258.92	15258	5.87	1900	5.79	15.650	0.399	17.50
(178.16)	(67.87)	(9.47)			(57.872)	(1.440)	(87.8)

MAXIMUM POWER IN SELECTED GEAR

245.07	15518	5.87	1900	5.67	7th (2-3) Gear	186	65	80	28.94
(181.26)	(49.13)	(9.47)				(85.3)	(18.5)	(24.7)	(97.7)

DRAWBAR PERFORMANCE AT 1750 RPM

Power hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Gears shift speed rpm	Slope %	Fuel Consumption gal/hr (lph)	Temp. °F (°C)	Barom. in. Hg (kPa)
						Cond. wet cool	Air dry bulb
Maximum Available Power — Two Hours 7th (5-3) Gear							
257.45	16540	5.58	1750	4.18	15.755	0.395	17.87
(177.85)	(73.37)	(8.98)			(58.87)	(1.440)	(87.8)

MAXIMUM POWER IN SELECTED GEAR

241.80	16840	5.58	1750	4.24	7th (2-3) Gear	185	64	72	28.89
(180.51)	(74.91)	(8.97)				(85.3)	(17.8)	(22.2)	(97.56)

TIRES, BALLAST AND WEIGHT

Base Tire	Ballast	Weight
Four 20-8-58, 8, inner	Four 20-8-58, 8, inner	Four 20-8-58, 8, inner
Four 20-8-58, 8, outer	Four 20-8-58, 8, outer	Four 20-8-58, 8, outer
Four 20-8-58, 8, inner	Four 20-8-58, 8, inner	Four 20-8-58, 8, inner
Four 20-8-58, 8, outer	Four 20-8-58, 8, outer	Four 20-8-58, 8, outer
Four 20-8-58, 8, inner	Four 20-8-58, 8, inner	Four 20-8-58, 8, inner
Four 20-8-58, 8, outer	Four 20-8-58, 8, outer	Four 20-8-58, 8, outer
Four 20-8-58, 8, inner	Four 20-8-58, 8, inner	Four 20-8-58, 8, inner
Four 20-8-58, 8, outer	Four 20-8-58, 8, outer	Four 20-8-58, 8, outer
Four 20-8-58, 8, inner	Four 20-8-58, 8, inner	Four 20-8-58, 8, inner
Four 20-8-58, 8, outer	Four 20-8-58, 8, outer	Four 20-8-58, 8, outer

THREE POINT HITCH PERFORMANCE

Operating Maximum Pressure (psi)	2500	(172.4)
Location	remote outlet	
Hydraulic oil temperature (°F)	118	(48)
Location	pump inlet	
Maximum Lift Capacity	11,752	(5366)
Quick Attach	Yes	
Category	IV	
Load (lb)	11,752	(5366)
Time (s)	4.10	
Hitch Point Movement (in)		
Lowest position	14.1	(358)
Top of travel range	44.2	(1129)
Highest position	45.0	(1143)
Load CG Movement (in)		
Lowest position	15.2	(395)
Top of travel range	46.7	(1197)
Highest position	50.4	(1280)

*Implement load capacity for transport purposes not specified by manufacturer.
 **The manufacturer's claimed capacity was 11,750 lb (5366 kg).

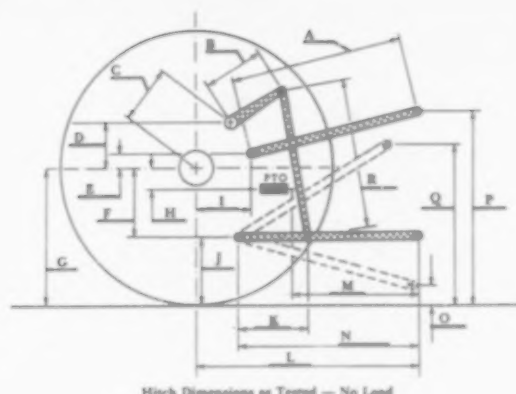
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power test, the fuel temperature at the injection pump inlet was maintained at 125°F (51.7°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1566, June 21, 1985.

LOUIS I. LEVITICUS
 Engineer-in-Charge

K. VON BARGEN
 L. L. BASHFORD
 T. L. THOMPSON
 Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	29.1	740
B	18.6	472
C	20.5	516
D	19.0	483
E	12.5	319
F	10.1	257
G	33.0	839
H	NA	NA
I	24.3	617
J	22.6	575
K	25.0	635
L	53.4	1356
L'	59.9	1521
M	NA	NA
N	43.0	1092
O	8.0	203
P	49.6	1260
Q	41.8	1060
R	55.3	843

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Versatile 876 Manual Diesel

Agricultural Research Division
 Institute of Agriculture and Natural Resources
 University of Nebraska-Lincoln
 Irvin T. Ostved, Dean and Director

NEBRASKA TRACTOR TEST 1570—VERSATILE 936 MANUAL DIESEL 12 SPEED

DRAWBAR PERFORMANCE AT 2100 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Sleeve % (inches)	Fuel Consumption gal/hr (l/hr)	Temp. °F (°C)	Barom. inches Hg (kPa)

Maximum Available Power—Two Hours 7th (2-3) Gear

254.42	14067	6.78	2100	8.29	10.445	0.451	13.47	185	57	67	28.98
(189.72)	(62.57)	(10.93)			(32.249)	(17.048)	(87.4)	(13.6)	(19.4)	(27.86)	

75% of Pull at Maximum Power—Ten Hours 7th (2-3) Gear

210.28	10860	7.30	2234	2.29	14.979	0.497	14.04	185	59	71	28.83
(154.86)	(48.67)	(11.74)			(54.788)	(22.582)	(27.64)	(89.5)	(17.3)	(21.7)	(27.44)

50% of Pull at Maximum Power—Two Hours 7th (2-3) Gear

144.46	7294	7.32	2293	1.45	11.932	0.577	12.90	181	58	72	28.96
(107.73)	(32.94)	(12.23)			(44.243)	(26.93)	(22.83)	(82.8)	(14.4)	(22.2)	(27.78)

50% of Pull at Reduced Engine Speed—Two Hours 10th (3-5) Gear

144.61	7293	7.58	1932	1.57	9.978	0.435	10.11	185	58	73	28.92
(107.84)	(32.94)	(12.22)			(36.488)	(20.24)	(17.77)	(87.4)	(14.2)	(22.5)	(27.66)

MAXIMUM POWER IN SELECTED GEARS

227.74	29495	2.90	2129	14.96	2nd (1-2) Gear	182	50	92	28.75
(168.81)	(91.24)	(4.84)				(87.1)	(13.6)	(18.7)	(27.68)
244.95	28714	3.50	2099	9.48	3rd (1-3) Gear	185	59	71	28.96
(182.45)	(81.62)	(5.64)				(89.4)	(17.3)	(21.7)	(27.79)
252.58	22594	4.19	2098	6.45	4th (1-4) Gear	185	58	71	28.96
(188.15)	(68.56)	(6.73)				(89.4)	(17.3)	(21.7)	(27.79)
258.58	19465	4.98	2099	5.06	5th (2-1) Gear	185	58	71	28.96
(192.82)	(56.54)	(8.32)				(89.4)	(17.3)	(21.7)	(27.79)
338.01	18605	5.95	2099	4.12	6th (2-2) Gear	185	58	71	28.96
(248.15)	(53.85)	(9.43)				(89.4)	(17.3)	(21.7)	(27.79)
280.45	14408	6.78	2097	5.51	7th (2-3) Gear	185	58	69	28.97
(199.22)	(41.06)	(11.43)				(89.4)	(17.3)	(20.6)	(27.87)
254.24	12213	7.35	2100	2.68	8th (2-4) Gear	185	59	70	28.96
(192.57)	(34.52)	(12.74)				(89.4)	(17.3)	(20.3)	(27.79)
251.42	9427	10.00	2098	1.95	9th (3-1) Gear	185	59	70	28.96
(187.46)	(26.45)	(16.01)				(89.4)	(17.3)	(21.1)	(27.79)

LUGGING ABILITY IN 7th (2-3) GEAR

Crankshaft Speed rpm	2097	1887	1671	1490	1253	1045
Pull—lb (kN)	14408	16506	18302	20983	19485	17656
	(64.58)	(72.88)	(81.42)	(94.74)	(86.98)	(78.54)
Increase in Pull %	0	14	27	39	55	25
Power—Hp (kW)	280.45	284.21	280.87	247.36	206.81	156.70
	(199.22)	(197.02)	(194.55)	(184.46)	(154.22)	(116.85)
Speed—mph (km/h)	6.78	6.05	5.55	4.92	5.98	5.54
	(10.93)	(9.74)	(8.94)	(7.93)	(9.63)	(8.94)
Sleeve %	5.55	5.97	4.80	5.37	5.06	4.44

TRACTOR SOUND LEVEL WITH CAB	1750 RPM dBA	1900 RPM dBA	2100 RPM dBA
Maximum Available Power—Two Hours	79.5	80.5	80.0
75% of Pull at Maximum Power—Ten Hours			81.5
50% of Pull at Maximum Power—Two Hours			81.5
50% of Pull at Reduced Engine Speed—Two Hours			76.5
Brake on in 12th (3-4) gear			95.0

Department of Agricultural Engineering

Dates of Test: May 15 to 20, 1985

Manufacturer: VERSATILE FARM EQUIPMENT COMPANY, 1260 Clarence Avenue, Winnipeg, Manitoba, Canada R3T 1T3

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60/60°F (15/15°C) 0.8581 Fuel weight 6.978 lb/gal (0.836 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 8.855 gal (33.511 l) Drained from motor 8.198 gal (31.034 l) Transmission and hydraulic lubricant Versatile HyGear 25 or equivalent Final drive lubricant SAE 85W-140 Total time engine was operated 45.0 hours.

ENGINE: Make Cummins Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. 11229178 Crankshaft lengthwise Rated rpm 1750 to 2100 Bore and stroke 5.5" x 6.0" (139.7 mm x 152.4 mm) Compression ratio 14.5 to 1 Displacement 855 cu in (14.013 m) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge and one bypass cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper cartridges Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive with duals Serial No. 956 85 227111 Tread width rear 72" (1830 mm) to 134" (3404 mm) front 72" (1830 mm) to 134" (3404 mm) Wheel base 129.9" (3300 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 77.4" (1965 mm) Vertical distance above roadway 42" (1068 mm) Horizontal distance from center of rear wheel tread (7" (9 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed 1 trio Advertised speeds mph (km/h) first 2.7 (4.3) second 3.2 (5.1) third 3.7 (5.9) fourth 4.3 (6.9) fifth 5.0 (8.0) sixth 5.8 (9.3) seventh 6.7 (10.7) eighth 7.7 (12.3) ninth 9.8 (15.7) tenth 11.5 (18.2) eleventh 13.0 (21.0) twelfth 15.2 (24.5) reverse 5.6 (8.8), 4.1 (6.6), 4.8 (7.7), 5.5 (8.9) Clutch dual dry disc operated by foot pedal Brakes caliper disc hydraulically operated by foot pedal Steering hydrostatic and articulated Turning radius (on concrete surface without brake) right 239" (6.07 m) left 239" (6.07 m) Turning space diameter (on concrete surface without brake) right 490" (12.45 m) left 490" (12.45 m) Power take-off none Unladen tractor mass 26950 lb (12225 kg).

DRAWBAR PERFORMANCE AT 1900 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Sleeve % (inches)	Fuel Consumption gal/hr (l/hr)	Temp. °F (°C)	Barom. inches Hg (kPa)

Maximum Available Power—Two Hours 7th (2-3) Gear

259.95	15088	6.10	1900	4.01	10.000	0.430	16.25	182	55	62	29.03
(193.85)	(51.12)	(9.81)			(30.548)	(24.2)	(12.00)	(83.1)	(12.5)	(16.4)	(28.01)

MAXIMUM POWER IN SELECTED GEAR

264.63	16270	6.10	1900	5.97	7th (2-3) Gear	185	58	69	28.97
(197.14)	(52.82)	(9.82)				(89.5)	(14.4)	(20.6)	(27.81)

DRAWBAR PERFORMANCE AT 1750 RPM

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Sleeve % (inches)	Fuel Consumption gal/hr (l/hr)	Temp. °F (°C)	Barom. inches Hg (kPa)

Maximum Available Power—Two Hours 7th (2-3) Gear

258.76	17372	5.59	1750	4.44	15.499	0.418	16.70	184	58	68	29.00
(193.96)	(57.27)	(8.99)			(58.609)	(23.4)	(13.28)	(84.2)	(14.2)	(20.6)	(27.91)

MAXIMUM POWER IN SELECTED GEAR

265.25	17660	5.59	1750	4.44	7th (2-3) Gear	185	59	70	28.97
(196.30)	(58.55)	(9.00)				(89.5)	(14.4)	(21.1)	(27.81)

TIRES, BALLAST AND WEIGHT

Item	With Ballast	Without Ballast
Raw Tires	—No. size, ply & psi (kPa): Four 24.5-52, 10 inner 14 (95) outer 12 (85) 1450 lb (649 kg)	Four 24.5-52, 10 inner 14 (95) outer 12 (85) None
Ballast	—Liquid (each inner): None	None
Front Tires	—No. size, ply & psi (kPa): Four 24.5-52, 10 inner 14 (95) outer 12 (85) 1200 lb (544 kg)	Four 24.5-52, 10 inner 14 (95) outer 12 (85) None
Ballast	—Liquid (each inner): None	None
—Cast Iron (each):	None	None
Height of Drawbar	18.5 in (470 mm)	18.5 in (470 mm)
Basic Weight with Operator—Rear	15625 lb (6771 kg)	10905 lb (4947 kg)
—Front	15560 lb (6914 kg)	16160 lb (7310 kg)
—Total	32585 lb (14685 kg)	27125 lb (12304 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2475 (17060)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	129 (54)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	yes	
CATEGORY	IV	*not measured
LOAD lbs (kg)	** 15028 (5909)	
TIME sec	5.91	
HITCH POINT MOVEMENT in (mm)		
Lowest position	15.8 (400)	
Top of timed range	45.8 (1162)	
Highest position	44.7 (1135)	
LOAD CG MOVEMENT in (mm)		
Lowest position	15.2 (395)	
Top of timed range	49.2 (1250)	
Highest position	50.6 (1280)	

*Implement load capacity for transport purposes not specified by manufacturer
**The manufacturer's claimed capacity was 21700 lb (9840 kg)

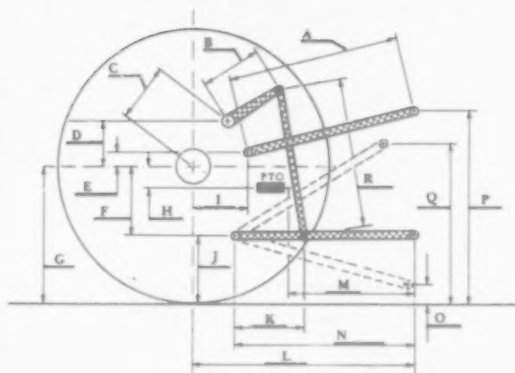
REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 120°F (48.9°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1570, June 21, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers



Minch Dimensions as Tested — No Load

	inch	mm
A	29.5	743
B	18.6	472
C	20.5	516
D	19.0	483
E	12.6	319
F	10.4	263
G	32.0	813
H	NA	NA
I	24.5	617
J	21.6	549
K	25.0	635
L	53.4	1356
M	59.9	1521
N	NA	NA
O	43.0	1092
P	7.9	200
Q	48.6	1233
R	41.5	1054
S	32.8	832

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Versatile 936 Manual Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Ervin T. Ostrowski, Dean and Director

NEBRASKA TRACTOR TEST 1558—WHITE FARM EQUIPMENT 4-225 DIESEL 18 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption g/lhr (L/hr)	Hydraulic flow (gpm) (L/min)	Hydraulic pressure (psi) (kPa)	Cooling medium Temp °F (°C)	Air wet bulb °F (°C)	Air dry bulb °F (°C)	Barometer inches Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed — 1082 rpm)								
195.65 (143.90)	2600	12.540 (47.476)	0.447 (0.272)	15.60 (1.074)	189 (87.2)	63 (17.6)	75 (23.8)	28.88 (97.51)
VARYING POWER AND FUEL CONSUMPTION — Two Hours								
170.62 (127.23)	2600	11.532 (43.631)	0.471 (0.282)	14.80 (1.035)	188 (86.7)	64 (17.8)	76 (24.4)	—
0.00 (0.00)	2816 (19.640)	4.350 (16.464)	—	—	179 (81.4)	64 (17.8)	75 (23.8)	—
88.08 (65.48)	2752 (19.117)	7.046 (26.117)	0.630 (0.388)	11.07 (0.781)	182 (83.3)	65 (17.2)	75 (23.8)	—
190.60 (140.61)	2600	12.491 (47.283)	0.443 (0.269)	15.74 (1.101)	190 (87.8)	66 (19.0)	77 (25.0)	—
44.44 (32.16)	2785 (20.186)	6.179 (23.186)	0.968 (0.596)	7.18 (0.471)	180 (82.2)	64 (17.8)	74 (23.1)	—
129.95 (96.89)	2709 (19.779)	9.716 (36.279)	0.521 (0.321)	13.57 (0.944)	185 (84.7)	64 (17.8)	75 (23.8)	—
As (18.24)	194.95 (142.94)	2721 (10.349)	6.578 (0.375)	12.06 (0.833)	184 (84.4)	64 (17.8)	75 (23.8)	28.86 (97.46)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Thrust % (%)	Fuel Consumption g/lhr (L/hr)	Hydraulic flow (gpm) (L/min)	Hydraulic pressure (psi) (kPa)	Cooling medium Temp °F (°C)	Air wet bulb °F (°C)	Air dry bulb °F (°C)	Barometer inches Hg (kPa)
Maximum Available Power — Two Hours 11th (4D) Gear											
168.78 (125.86)	11571 (51.47)	5.47 (8.80)	2600	5.56 (40.476)	12.578 (47.311)	0.511 (0.326)	13.54 (0.944)	191 (88.3)	61 (16.1)	78 (25.6)	28.96 (97.74)
75% of Pull at Maximum Power — Two Hours 11th (4D) Gear											
155.56 (116.60)	8773 (39.02)	8.71 (14.02)	2600	2.64 (19.699)	10.732 (40.049)	0.561 (0.347)	12.42 (0.863)	188 (86.6)	62 (16.6)	72 (22.2)	28.95 (97.74)
50% of Pull at Maximum Power — Two Hours 11th (4D) Gear											
91.27 (68.06)	5851 (26.02)	5.85 (9.42)	2729 (19.62)	1.69 (12.392)	8.742 (32.495)	0.668 (0.418)	10.44 (0.741)	187 (86.2)	61 (16.1)	81 (27.2)	28.94 (97.71)
50% of Pull at Reduced Engine Speed — Two Hours 11th (5D) Gear											
91.30 (68.08)	5851 (26.02)	5.85 (9.42)	1572 (11.62)	2.01 (15.021)	6.583 (24.262)	0.464 (0.297)	15.01 (10.85)	185 (85.0)	63 (17.2)	56 (16.7)	29.05 (98.01)
MAXIMUM POWER IN SELECTED GEARS											
142.18 (106.02)	22865 (101.71)	2.55 (4.10)	2601 (19.75)	11.90 (88.41)	3rd (2L) Gear	—	—	184 (84.4)	66 (19.0)	51 (10.6)	29.06 (108.11)
154.45 (113.16)	22726 (99.31)	2.59 (4.17)	2508 (18.47)	12.34 (92.22)	4th (1C) Gear	—	—	185 (84.7)	68 (20.0)	54 (12.2)	29.06 (108.11)
165.65 (122.02)	20591 (91.59)	2.98 (4.80)	2507 (18.46)	8.51 (63.11)	5th (2D) Gear	—	—	187 (86.1)	59 (17.2)	65 (18.3)	28.97 (107.81)
164.65 (122.78)	18582 (82.83)	5.32 (8.53)	2508 (18.47)	6.72 (50.06)	6th (3L) Gear	—	—	188 (86.6)	60 (17.8)	67 (19.6)	28.98 (107.86)
165.08 (123.01)	17019 (77.26)	5.64 (9.05)	2508 (18.47)	5.84 (43.71)	7th (2C) Gear	—	—	188 (86.6)	60 (17.8)	68 (20.0)	28.98 (107.86)
168.88 (125.94)	15550 (69.26)	4.15 (6.66)	2600 (19.62)	5.24 (39.30)	8th (3D) Gear	—	—	189 (86.6)	61 (17.2)	71 (21.7)	28.99 (107.89)
167.74 (125.09)	14155 (64.36)	4.44 (7.15)	2601 (19.62)	4.56 (34.21)	9th (4L) Gear	—	—	189 (86.6)	61 (17.2)	72 (21.7)	28.99 (107.89)
166.78 (124.77)	12640 (56.22)	4.95 (7.96)	2600 (19.62)	5.79 (43.41)	10th (5C) Gear	—	—	189 (86.6)	61 (17.2)	73 (21.7)	28.98 (107.86)
170.57 (127.16)	11097 (50.01)	5.47 (8.80)	2509 (18.46)	5.48 (41.01)	11th (4D) Gear	—	—	190 (87.2)	62 (17.2)	76 (24.4)	28.98 (107.86)
165.95 (123.73)	9554 (42.43)	6.33 (10.50)	2600 (19.62)	2.85 (21.50)	12th (4C) Gear	—	—	190 (87.2)	61 (17.2)	75 (23.8)	28.97 (107.83)
167.19 (124.67)	9449 (42.01)	6.64 (10.68)	2507 (18.46)	2.77 (20.80)	13th (5U) Gear	—	—	190 (87.2)	61 (17.2)	74 (23.8)	28.97 (107.83)
167.01 (124.54)	7605 (34.21)	8.14 (13.05)	2509 (18.47)	2.29 (17.33)	14th (5D) Gear	—	—	190 (87.2)	62 (17.2)	75 (23.8)	28.98 (107.86)

Department of Agricultural Engineering

Dates of Test: April 9 to 15, 1985

Manufacturers: WHITE FARM EQUIPMENT COMPANY, 2625 Butterfield Road, Oakbrook, Illinois 60521

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.5 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15/15°C) 0.8574 Fuel weight 6.972 lb/gal (0.816 kg/l) Oil White Farm Equipment Company Supreme Motor Oil SAE 30 API service classification CC-CD-SD-SE-SF To motor 7.692 gal (29.119 l) Drained from motor 7.244 gal (27.420 l) Transmission and final drive lubricant White Farm Equipment Company Universal Fluid Total time engine was operated 35.0 hours.

ENGINE: Make Caterpillar Diesel Type right cylinder vee with turbocharger Serial No. 03Z05080 Crankshaft lengthwise Rated rpm 2600 Bore and stroke 4.5" x 5.0" (114.3 mm x 127 mm) Compression ratio 16.5 to 1 Displacement 656 cu in (10.422 m) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter two full flow cartridges Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil, radiator for hydraulic shift oil Fuel filter one paper cartridge and water separator Muffler underhood Exhaust vertical Cooling medium temperature control two thermostats.

CHASSIS: Type four wheel drive with dual Serial No. 502272-427 Tread width rear 60" (1524 mm) to 126" (3200 mm) front 60" (1524 mm) to 126" (3200 mm) Wheel base 117.75" (2990 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 70.6" (1793 mm) Vertical distance above roadway 43.7" (1110 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (S) range operator controlled powershift Advertised speeds mph (km/h) first 2.9 (4.7) second 2.5 (4.0) third 2.6 (4.2) fourth 2.9 (4.7) fifth 3.5 (5.6) sixth 5.6 (9.0) seventh 5.8 (9.3) eighth 4.3 (6.9) ninth 4.6 (7.4) tenth 5.1 (8.2) eleventh 5.6 (9.0) twelfth 6.6 (10.6) thirteenth 6.7 (10.8) fourteenth 8.2 (13.2) fifteenth 9.7 (15.6) sixteenth 11.7 (18.8) seventeenth 14.2 (22.9) eighteenth 16.9 (27.2) reverse 2.5 (4.0), 2.9 (4.6), 3.4 (5.5), 4.1 (6.6), 5.0 (8.0), 5.9 (9.5) Clutch dual drive operated by foot pedal Brakes multiple wet disc hydraulically power activated and operated by foot pedal Steering hydromatic and articulated Turning radius (on concrete surface without brake) right 210° (5.33 m) left 210° (5.33 m) Turning space

LUGGING ABILITY IN 11th (4D) GEAR

Crankshaft Speed rpm	2599	2545	2080	1815	1560	1298
Pull—lb (kN)	11697 (52.03)	15245 (68.02)	14555 (64.73)	15282 (67.90)	15079 (67.03)	15654 (69.54)
Increase in Pull %	0	15	24	31	36	54
Power—Hp (kW)	170.57 (127.19)	175.15 (129.10)	167.88 (125.19)	155.24 (114.27)	156.47 (101.76)	111.85 (83.40)
Speed—Mph (km/h)	5.47 (8.80)	4.90 (7.89)	4.55 (6.96)	3.76 (6.05)	3.22 (5.19)	2.68 (4.32)
Slip %	5.48	4.02	4.48	4.94	5.24	5.24

TRACTOR SOUND LEVEL WITH CAB

	dB(A)
Maximum Available Power—Two Hours	78.0
75% of Pull at Maximum Power—Ten Hours	78.0
50% of Pull at Maximum Power—Two Hours	78.0
50% of Pull at Reduced Engine Speed—Two Hours	77.5
Bystander in 18th (60) gear	90.0

TIMES, BALLAST AND WEIGHT

Bar Time	—No. sec. ply & psi (kPa)
Ballast	—Liquid (each) —Cast Iron (each)
Frame Time	—No. sec. ply & psi (kPa)
Ballast	—Liquid (each) —Cast Iron (each)
Height of Driver	
Static Weight with Operator—Rear	
—Front	
—Total	

Tested Without Ballast	
Four 18.4-58; 8, inner	
14 (95) outer 12 (85)	
None	
None	
Four 18.4-58; 8, inner	
14 (95) outer 12 (85)	
None	
None	
14 in. (355 mm)	
9665 lb. (4384 kg)	
14475 lb. (6566 kg)	
24140 lb. (10950 kg)	

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2200 (15170)
Location	remote outlet
Hydraulic oil temperature °F (°C)	156 (69)
Location	pump inlet
	Maximum Lift Capacity
QUICK ATTACH	yes
CATEGORY	III
LOAD lbs (kg)	6804 (3086)
TIME sec	4.01
HITCH POINT MOVEMENT in (mm)	
Lowest position	15.7 (398)
Top of timed range	59.9 (1014)
Highest position	40.0 (1016)
LOAD CG MOVEMENT in (mm)	
Lowest position	12.9 (328)
Top of timed range	45.1 (1146)
Highest position	45.4 (1153)

*Implement load capacity for transport purposes not specified by manufacturer.

diameter (on concrete surface without brake) right 450" (11.43 m) left 450" (11.43 m) Power take-off 1002 rpm at 2600 engine rpm Unladen tractor mass 25700 lbs (10750 kg).

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

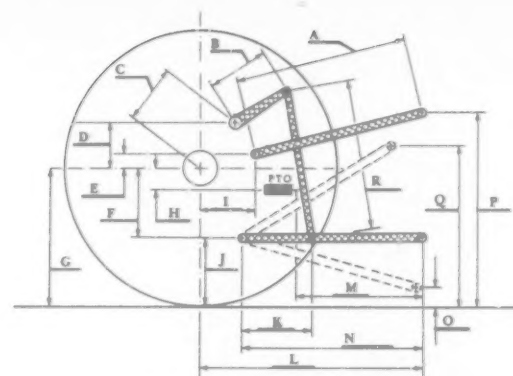
REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 156°F (69.1°C). Twelve gears were chosen between 15% slip and 10 mph (16.1 km/h). During final inspection of the engine, it was found that cylinder No. 2 was damaged due to a chipped oil ring.

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1558, June 19, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON

Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	25.4	645
B	16.0	406
C	20.1	511
D	18.6	472
E	10.2	259
F	9.7	246
G	31.3	795
H	1.9	48
I	9.3	236
J	21.6	549
K	22.5	566
L	45.6	1158
M	50.2	1275
N	28.4	721
O	39.7	1008
P	7.0	178
Q	45.1	1146
R	40.5	1029
L' to end of quick attach	40.0	1016



White Farm Equipment 4-225 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1559—WHITE FARM EQUIPMENT 4-270 DIESEL 16 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (kg/hr)	Bhp to PTO (kW)	Temp °F (°C)	Air wet bulb	Air dry bulb	Barometer inHg (kPa)
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MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed—Two hours (PTO Speed—1015 rpm)							
239.25	2100	14.480	0.422	16.32	196	66	75
(178.4)		(54.812)	(0.257)	(1.255)	(91.1)	(19.1)	(27.8)

Standard Power Take-off Speed (1000 rpm)—One Hour

242.50	2073	14.516	0.418	16.09	196	68	76
(180.6)		(54.950)	(0.254)	(1.200)	(91.1)	(19.8)	(27.9)

VARYING POWER AND FUEL CONSUMPTION—Two Hours

209.28	2161	15.140	0.458	15.95	198	68	76
(156.06)		(49.742)	(0.266)	(1.130)	(91.1)	(20.0)	(27.2)
0.00	2286	3.740	—	—	194	68	75
(0.00)		(11.191)	—	—	(89.7)	(19.7)	(27.6)
108.05	2251	8.435	0.545	12.81	195	67	76
(80.57)		(25.415)	(0.311)	(2.521)	(90.8)	(19.6)	(27.2)
240.97	2101	14.553	0.421	16.58	196	67	76
(179.20)		(55.015)	(0.256)	(1.266)	(91.1)	(19.2)	(27.2)
54.56	2265	6.213	0.795	8.78	194	66	75
(40.68)		(23.320)	(0.453)	(1.710)	(90.0)	(18.6)	(27.3)
159.75	2199	10.728	0.469	14.89	195	66	75
(119.12)		(40.610)	(0.287)	(2.931)	(90.8)	(18.6)	(27.3)
Ar 158.77	2207	9.467	6.513	15.60	195	67	75
(Ar 66.82)		(35.036)	(0.312)	(2.600)	(90.5)	(19.6)	(27.8)

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Temp °F (°C)	Fuel Consumption gal/hr (kg/hr)	Bhp to PTO (kW)	Cooling medium	Air wet bulb	Air dry bulb	Barometer inHg (kPa)
Maximum Available Power—Two Hours 9th (5A) Gear										
207.98	11794	6.61	2100	5.00	14.518	0.480	14.53	197	60	75
(155.09)	(52.46)	(10.64)			(54.201)	(0.292)	(2.661)	(91.4)	(17.8)	(27.9)
75% of Pull at Maximum Power—Ten Hours 9th (5A) Gear										
166.02	9019	6.90	2173	2.20	12.275	0.516	15.55	197	59	75
(123.80)	(40.12)	(11.11)			(46.858)	(0.314)	(2.665)	(91.5)	(17.5)	(27.8)
50% of Pull at Maximum Power—Two Hours 9th (5A) Gear										
113.65	6013	7.09	2213	1.48	9.555	0.506	11.90	197	62	79
(84.75)	(26.73)	(11.41)			(36.161)	(0.357)	(2.364)	(91.7)	(18.7)	(27.0)
50% of Pull at Reduced Engine Speed—Two Hours 12th (5D) Gear										
113.62	6012	7.09	1289	1.26	8.112	0.498	14.01	195	62	81
(84.73)	(26.74)	(11.41)			(30.209)	(0.303)	(2.739)	(90.5)	(18.7)	(27.2)

MAXIMUM POWER IN SELECTED GEARS

180.39	27180	2.49	2135	14.85	3rd (1C) Gear	197	58	67	28.81
(134.52)	(120.90)	(4.01)				(91.2)	(14.4)	(19.6)	(97.26)
200.55	24164	3.11	2098	9.09	4th (1D) Gear	197	57	69	28.74
(149.18)	(107.68)	(5.00)				(91.7)	(15.9)	(20.6)	(97.05)
205.77	22590	3.58	2099	7.76	5th (2A) Gear	198	58	70	28.74
(151.95)	(100.68)	(5.66)				(91.6)	(14.6)	(21.1)	(97.05)
208.08	19629	4.19	2097	5.44	6th (2B) Gear	196	50	73	28.74
(155.16)	(82.86)	(6.74)				(91.1)	(17.8)	(22.8)	(97.05)
208.52	15456	5.05	2098	4.24	7th (2C) Gear	196	59	71	28.74
(155.16)	(68.75)	(8.13)				(91.1)	(15.6)	(21.2)	(97.05)
207.62	12805	6.08	2099	3.50	8th (2D) Gear	197	55	63	28.74
(154.81)	(59.96)	(9.79)				(91.4)	(12.8)	(17.2)	(97.05)
211.70	12025	6.60	2097	3.00	9th (3A) Gear	196	60	74	28.74
(157.66)	(53.69)	(10.62)				(91.1)	(15.8)	(21.3)	(97.05)
211.04	9819	8.04	2097	2.50	10th (3B) Gear	195	56	67	28.74
(157.37)	(41.81)	(12.91)				(90.6)	(13.3)	(19.6)	(97.05)

Department of Agricultural Engineering

Dates of Test: April 10 to 18, 1985

Manufacturer: WHITE FARM EQUIPMENT COMPANY, 2625 Butterfield Road, Oakbrook, Illinois 60521

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 48.3 (rating taken from oil company's inspection data) Specific gravity converted to 60° 60°F (15/15°C) 0.8380 Fuel weight 6.977 lb/gal (0.836 kg/l) Oil White Farm Equipment Company Supreme Motor Oil SAE 30 API service classification CC-CD-SD-SE-SE To motor 5.589 gal (20.400 l) Drained from motor 4.597 gal (17.403 l) Transmission and final drive lubricant White Farm Equipment Company Universal Fluid Total time engine was operated 36.5 hours.

ENGINE: Make Caterpillar Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. 64Z02249 Crankshaft lengthwise Rated rpm 1700 to 2100 Bore and stroke 4.75" x 6.00" (120.7 mm x 152.4 mm) Compression ratio 15.0 to 1 Displacement 638 cu in (10457 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements with aspirator Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter one paper cartridge and water separator Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type four wheel drive with dual Serial No. 502705-432 Tread width rear 63" (1603 mm) to 132" (3353 mm) front 63" (1600 mm) to 132" (3353 mm) Wheel base 129.5" (3289 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 72.8" (1850 mm) Vertical distance above roadway 39.5" (1003 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (4) range operator controlled powershift Advertised speeds mph (km/h) first 1.9 (3.1) second 2.3 (3.7) third 2.7 (4.4) fourth 3.3 (5.3) fifth 5.5 (8.7) sixth 4.3 (6.8) seventh 5.1 (8.2) eighth 6.0 (9.7) ninth 6.5 (10.5) tenth 7.9 (12.7) eleventh 9.4 (15.2) twelfth 11.2 (18.1) thirteenth 12.0 (19.4) fourteenth 14.6 (23.4) fifteenth 17.3 (27.9) sixteenth 20.7 (33.3) reverse 3.0 (4.9), 3.5 (5.9), 4.3 (7.0), 5.2 (8.3) Clutch multiple wet disc hydraulically power activated by foot pedal Brakes multiple wet disc hydraulically power activated and operated by foot pedal Steering hydrostatic and articulated Turning radius on concrete surface without brake right 291" (7.39 m) left 291" (7.39 m) Turning space diameter on concrete surface without brake right 604" (15.34 m) left 604" (15.34 m) Power take-off 1000 rpm at 2075 engine rpm Unladen tractor mass 50215 lbs (13705 kg).

LUGGING ABILITY IN 9th (5A) GEAR						
Crankshaft Speed rpm	2097	1888	1672	1466	1247	1046
Pull—lb (kN)	12025 (53.49)	14051 (62.41)	15082 (67.88)	15532 (69.89)	15599 (70.29)	15873 (71.71)
Increase in Pull %	0	17	25	29	28	15
Power—Hp (kW)	211.70 (157.86)	221.01 (164.81)	209.47 (156.20)	189.02 (140.95)	159.45 (118.89)	121.08 (90.29)
Speed—Mph (km/h)	6.60 (10.62)	5.91 (9.51)	5.22 (8.39)	4.56 (7.36)	3.86 (6.23)	3.27 (5.27)
Slip %	3.00	3.66	3.99	4.16	3.99	5.83

TRACTOR SOUND LEVEL WITH CAB		dB(A)
Maximum Available Power—Two Hours		79.0
75% of Pull at Maximum Power—Ten Hours		78.5
50% of Pull at Maximum Power—Two Hours		78.5
50% of Pull at Reduced Engine Speed—Two Hours		75.0
bystander in 15th (4C) gear		90.5

POWER TAKE-OFF PERFORMANCE at 1900 RPM

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (kg/hr)	Bhp to PTO (kW)	Temp °F (°C)	Air wet bulb	Air dry bulb	Barometer inHg (kPa)
Rated Engine Speed—Two hours (PTO Speed—816 rpm)							
251.54	1900	14.420	0.400	17.44	196	68	76
(187.37)		(54.347)	(0.243)	(3.437)	(91.2)	(20.0)	(27.5)

POWER TAKE-OFF PERFORMANCE at 1700 RPM

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (kg/hr)	Bhp to PTO (kW)	Temp °F (°C)	Air wet bulb	Air dry bulb	Barometer inHg (kPa)
Rated Engine Speed—Two hours (PTO Speed—830 rpm)							
241.00	1701	13.606	0.594	17.71	197	66	76
(179.72)		(51.505)	(0.290)	(1.580)	(91.7)	(19.4)	(27.6)

MAXIMUM POWER AND FUEL CONSUMPTION

241.00	1701	13.606	0.594	17.71	197	66	76
(179.72)		(51.505)	(0.290)	(1.580)	(91.7)	(19.4)	(27.6)

TIRES, BALLAST AND WEIGHT

Rear Tires	—No., size, ply & psi (kPa)
Ballast	—Laid on (each)
Front Tires	—No., size, ply & psi (kPa)
Ballast	—Laid on (each)
	—Cast iron (each)

Height of Drawbar

Static Weight with Operator—Rear	14 in. (355 mm)
—Front	15415 lb. (6989 kg)
—Total	17255 lb. (7818 kg)
	50650 lb. (22981 kg)

Tested Without Ballast

Four 20.5-50, 8, inner	14 in. (355 mm)
Four 20.5-50, 8, outer	14 in. (355 mm)
Four 20.5-50, 8, inner	14 in. (355 mm)
Four 20.5-50, 8, outer	14 in. (355 mm)
Four 20.5-50, 8, inner	14 in. (355 mm)
Four 20.5-50, 8, outer	14 in. (355 mm)

crete surface without brake) right 604" (15.34 m) left 604" (15.34 m) Power take-off 1000 rpm at 2075 engine rpm Unladen tractor mass 50215 lbs (13705 kg).

REPAIRS AND ADJUSTMENTS: During the preliminary PTO test a leak developed in the PTO carrier bearing lubricant tube. This tube was replaced and test continued.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 135°F (57.2°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is as true and correct report of official Tractor Test No. 1559, June 19, 1985.

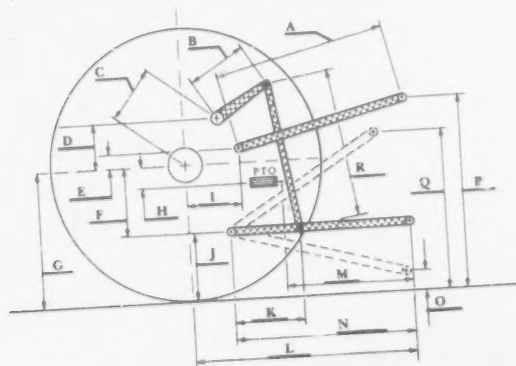
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
L. L. BASHFORD
T. L. THOMPSON
Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure (psi) (kPa)	2275 (15690)	remote outlet
Location	166 (74)	
Hydraulic oil temperature (°F) (°C)	166 (74)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH CATEGORY	155 (III)	*Not measured
LOAD lbs (kg)	12504 (5672)	
TIME sec	5.35	
HITCH POINT MOVEMENT in (mm)		
Lowest position	10.7 (272)	
Top of timed range	36.7 (932)	
Highest position	40.2 (1021)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.8 (300)	
Top of timed range	36.5 (927)	
Highest position	40.3 (1024)	

*Implement load capacity for transport purposes not specified by manufacturer.



Hitch Dimensions as Tested — No Load



White Farm Equipment 4-270 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1571—ZETOR 5245 DIESEL
ALSO ZETOR 5211 DIESEL
10 SPEED

POWER TAKE-OFF PERFORMANCE

Power (hp) (kW)	Crank shaft speed (rpm)	Fuel Consumption gal/hr (l/hr)	Hp-hr gal (kg/kWh)	Temp (°F) (°C)	Air wet bulb	Air dry bulb	Barometer in. Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed — Two hours (PTO Speed — 596 rpm)							
42.51 (31.70)	2200	2.650 (10.032)	0.457 (0.266)	16.04 (4.60)	181 (81.0)	75 (23.6)	29.15 (98.16)
Standard Power Take-off Speed (540 rpm) — One Hour							
40.10 (29.80)	1994	2.421 (9.165)	0.425 (0.258)	16.56 (4.26)	181 (81.0)	75 (23.6)	29.15 (98.17)
VARYING POWER AND FUEL CONSUMPTION — Two Hours							
37.44 (27.92)	2281	2.574 (9.667)	0.445 (0.270)	15.77 (3.105)	177 (80.3)	65 (18.0)	75 (23.6)
0.00 (0.00)	2418	0.851 (3.222)	—	—	175 (78.3)	65 (18.3)	74 (23.3)
19.52 (14.40)	2551	1.527 (5.781)	0.554 (0.337)	12.65 (2.492)	175 (79.4)	65 (18.5)	74 (23.1)
42.77 (31.89)	2200	2.644 (10.007)	0.453 (0.264)	16.18 (4.185)	180 (82.2)	65 (18.3)	75 (23.9)
9.80 (7.13)	2586	1.189 (4.502)	0.851 (0.518)	8.24 (1.624)	174 (78.0)	65 (18.3)	76 (24.2)
28.67 (21.38)	2528	1.951 (7.184)	0.477 (0.290)	14.70 (2.495)	176 (79.7)	65 (18.3)	75 (23.9)
Av (27.24)	2312	1.756 (6.447)	0.533 (0.324)	13.17 (2.594)	176 (79.8)	65 (18.4)	75 (23.7)

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/hr)	Hp-hr gal (kg/kWh)	Cool- ing med. temp. (°C)	Air wet bulb speed (°C)	Air dry bulb speed (°C)	Barom. in. Hg (kPa)
Maximum Available Power — Two Hours 8th (5H) Gear										
57.96 (42.30)	2460 (10.94)	5.79 (9.13)	2202	3.91	2.602 (9.851)	0.481 (0.292)	14.59 (2.873)	185 (85.0)	75 (23.6)	28.76 (97.12)
75% of Pull at Maximum Power — Ten Hours 8th (5H) Gear										
50.20 (37.23)	1860 (8.27)	6.09 (9.80)	2289	2.78	2.185 (8.264)	0.507 (0.308)	15.85 (2.725)	181 (82.2)	72 (22.3)	29.05 (98.06)
50% of Pull at Maximum Power — Two Hours 8th (5H) Gear										
20.79 (15.50)	1240 (5.52)	6.29 (10.12)	2345	1.88	1.718 (6.504)	0.580 (0.353)	12.10 (2.183)	178 (81.1)	69 (20.6)	29.14 (98.04)
50% of Pull at Reduced Engine Speed — Two Hours 9th (4H) Gear										
20.77 (15.49)	1240 (5.52)	6.28 (10.11)	1524	1.78	1.426 (5.398)	0.481 (0.293)	14.57 (2.870)	179 (81.1)	70 (21.1)	29.15 (98.15)
MAXIMUM POWER IN SELECTED GEARS										
50.56 (37.29)	5955 (26.49)	1.92 (3.10)	2279	14.80	4th (4L) Gear		179 (81.7)	68 (20.0)	72 (22.2)	28.95 (97.69)
36.35 (27.09)	5270 (23.44)	2.59 (4.18)	2200	10.82	5th (1H) Gear		185 (83.9)	69 (20.6)	74 (22.3)	28.92 (97.66)
37.21 (27.75)	4156 (18.40)	3.57 (5.43)	2198	7.26	6th (5L) Gear		185 (83.9)	70 (21.1)	75 (22.3)	28.92 (97.66)
38.13 (28.43)	3519 (15.65)	4.06 (6.34)	2200	5.77	7th (2H) Gear		184 (84.4)	70 (21.1)	77 (22.9)	28.91 (97.62)
38.44 (28.66)	2491 (11.08)	5.79 (9.21)	2201	5.91	8th (3H) Gear		187 (86.1)	75 (22.9)	83 (28.3)	28.76 (97.12)
36.90 (27.36)	1559 (6.84)	9.01 (14.50)	2201	2.45	9th (4H) Gear		185 (83.6)	72 (22.2)	79 (26.1)	28.90 (97.59)

Department of Agricultural Engineering

Dates of Test: August 22 to September 5, 1985

Manufacturer: AGROZET ZETOR, Brno 63200, Czechoslovakia

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from manufacturer's inspection data) Specific gravity converted to 60°/60°F (15°/15°C) 0.8423 Fuel weight 7.013 lbs/gal (0.840 kg/l) Oil SAE 15W-40 API service classification SE, SF, CG, CD to motor 2.280 gal (8.629 l) Drained from motor 2.017 gal (7.676 l) Transmission and final drive lubricant SAE 80W gear lubricant Total time engine was operated 53.5 hours

ENGINE: Make Zetor Diesel Type three cylinder vertical Serial No. 5201 005290 K Crankshaft lengthwise Rated rpm 2200 Bore and stroke 4.02" x 4.35" (102 mm x 110 mm) Compression ratio 17 to 1 Displacement 164.6 cu in (2696 ml) Starting system 12 volt Lubrication pressure Air cleaner oil bath with centrifugal pre-cleaner Air compressor direct engine drive Oil filter two metal sieve elements Fuel filter two paper elements and sediment bowl Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. 5245 005787 Tread width rear 56.1" (1423 mm) to 70.9" (1800 mm) front 59.4" (1510 mm) Wheel base 84.5" (2140 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 34.2" (869 mm) Vertical distance above roadway 34.6" (879 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive with throw out lever Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 0.7 (1.1) second 1.0 (1.7) third 1.4 (2.3) fourth 2.2 (3.6) fifth 2.9 (4.7) sixth 3.7 (6.0) seventh 4.4 (7.1) eighth 6.1 (9.8) ninth 9.3 (15.1) tenth 15.7 (25.3) reverse 0.9 (1.5), 3.8 (6.2) Clutch single dry disc operated by foot pedal Brakes drum and shoe hydraulically operated by two foot pedals which can be locked together Steering power assist Turning radius (on concrete surface with brake applied) right 161" (4.1 m) left 161" (4.1 m) on concrete surface without brake right 181" (4.6 m) left 181" (4.6 m) Turning space diameter (on concrete surface with brake applied) right 335" (8.5 m) left 335" (8.5 m) on concrete surface without brake right 378" (9.6 m) left 378" (9.6 m) Power take-off 540 rpm at 1994 engine rpm and 1000 rpm at 2050 engine rpm Unladen tractor mass 6755 lb (3055 kg).

LUGGING ABILITY IN 8th (5H) GEAR

Crankshaft Speed rpm	2201	1975	1759	1544	1318	1103
Pull—lbs	2491	2579	2650	2697	2670	2526
(AS)	(11.06)	(11.47)	(11.79)	(12.00)	(11.88)	(11.24)
Increase in Pull %	0	4	6	8	7	1
Power—Hp	38.44	35.61	32.55	29.04	24.55	19.49
(AR)	(28.66)	(26.56)	(24.27)	(21.66)	(18.11)	(14.53)
Speed—Mph	5.79	5.18	4.61	4.04	3.45	2.89
(RWS)	(9.31)	(8.31)	(7.41)	(6.50)	(5.55)	(4.66)
Slip %	3.91	4.11	4.11	4.24	4.24	3.98

TRACTOR SOUND LEVEL WITH CAB

	Front Wheel Drive Disengaged dB(A)	Engaged dB(A)
Maximum Available Power—Two Hours	83.5	83.0
75% of Pull at Maximum Power—Ten Hours		83.0
50% of Pull at Maximum Power—Two Hours		83.0
50% of Pull at Reduced Engine Speed—Two Hours		80.5
Bystander in 10th (5H) gear	86.0	

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp (AR)	Drawbar pull lbs (AS)	Speed mph (RWS)	Crank shaft rpm	Slip %	Fuel Consumption gal/hr (kg/hr)	Temp °F (°C)	Air wet bulb	Barom in. Hg (kPa)

Maximum Available Power — Two Hours 8th (5H) Gear

37.43	2459	5.71	2202	5.74	2.595	0.486	14.42	187	75	85	28.74
(27.91)	(10.94)	(9.19)			(9.824)	(0.296)	(2.841)	(86.1)	(21.9)	(29.2)	(97.03)

MAXIMUM POWER IN SELECTED GEARS

51.31	4558	2.58	2279	14.89	5th (1H) Gear	179	68	75	28.92
(21.14)	(20.27)	(4.15)				(81.4)	(20.0)	(22.8)	(97.66)
57.27	3550	3.94	2200	9.39	7th (2H) Gear	184	71	78	28.91
(27.79)	(15.79)	(6.14)				(84.2)	(21.7)	(25.6)	(97.62)
57.83	2488	5.70	2202	5.93	8th (5H) Gear	183	71	79	28.91
(28.21)	(11.07)	(9.18)				(83.9)	(21.7)	(26.1)	(97.62)

TIRES, BALLAST AND WEIGHT

Base Tires	With Ballast	Without Ballast
—No. size, ply & psi (kPa)	Two 16.9-14-28, 8, 24 (165)	Two 16.9-14-28, 8, 24 (165)
Ballast	None	None
—Liquid (each)	None	None
—Test equip. (each)	100 lb (45 kg)	None
Front Tires	With Ballast	Without Ballast
—No. size, ply & psi (kPa)	Two 9.5-9-24, 8, 28 (195)	Two 9.5-9-24, 8, 28 (195)
Ballast	None	None
—Liquid (each)	None	None
—Test equip. (each)	92 lb (42 kg)	None
Height of Drawbar	23.5 in (595 mm)	23.5 in (595 mm)
Static Weight with Operator—Rear	4355 lb (1975 kg)	4155 lb (1885 kg)
—Front	2940 lb (1334 kg)	2755 lb (1250 kg)
—Total	7295 lb (3309 kg)	6910 lb (3135 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2425 (16720)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	175 (78)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	II	*not measured
LOAD lbs (kg)	5500 (1497)	
TIME sec	2.55	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.1 (307)	
Top of timed range	36.1 (917)	
Highest position	36.1 (917)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.8 (300)	
Top of timed range	38.3 (973)	
Highest position	38.3 (973)	

*Implement load capacity for transport purposes not specified by manufacturer.

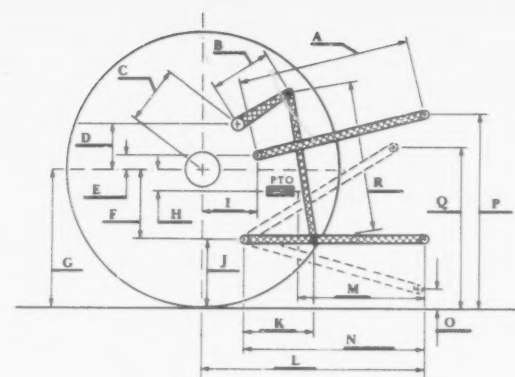
REPAIRS AND ADJUSTMENTS: During preliminary PTO tests, it was necessary to replace the washer in the crankcase oil filter base.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 136°F (57.9°C). Six gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1571, October 25, 1985.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load



Zetor 5245 Diesel

	inch	mm
A	25.5	648
B	12.6	320
C	14.3	364
D	14.3	363
E	12.7	323
F	5.4	138
G	26.7	678
H	0.3	7
I	11.3	288
J	21.3	540
K	15.8	401
L	37.0	940
M	26.7	677
N	33.8	857
O	8.0	203
P	40.3	1024
Q	35.4	899
R	20.5	521

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director

NEBRASKA TRACTOR TEST 1572—ZETOR 7245 DIESEL ALSO ZETOR 7211 DIESEL 10 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature (°F)			Barometer in./mm Hg (kPa)
		gal/hr (L/h)	B/hp hr (kg/kW h)	Hp-hr/gal (kW h/L)	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed—596 rpm)								
58.28 (43.46)	2200 (13.637)	5.605 (0.204)	0.434 (0.167)	16.18 (3.187)	180 (81.9)	66 (18.8)	75 (23.8)	29.14 (98.40)
Standard Power Take-off Speed (540 rpm)—One Hour								
54.91 (40.95)	1995 (12.161)	5.265 (0.234)	0.417 (0.161)	16.82 (3.113)	179 (81.9)	66 (18.8)	75 (23.8)	29.14 (98.40)

VARYING POWER AND FUEL CONSUMPTION—Two Hours

51.41 (38.14)	2285 (14.18)	5.148 (1.918)	0.429 (0.261)	16.55 (3.217)	177 (80.3)	66 (18.9)	75 (23.6)	—
0.90 (0.66)	2425 (14.990)	1.057 (0.400)	—	—	175 (78.3)	66 (18.9)	76 (24.2)	—
26.65 (19.88)	2568 (19.08)	2.058 (7.78)	0.541 (0.329)	12.95 (2.552)	175 (79.4)	65 (18.3)	75 (23.6)	—
58.54 (43.65)	2200 (13.637)	5.613 (2.083)	0.433 (0.263)	16.19 (3.190)	180 (82.2)	66 (18.8)	75 (23.9)	—
15.48 (10.05)	2394 (15.506)	1.454 (0.506)	0.737 (0.460)	9.27 (1.825)	173 (78.1)	67 (19.2)	76 (24.4)	—
59.26 (43.27)	2324 (10.151)	2.682 (1.015)	0.479 (0.291)	14.64 (2.883)	175 (79.2)	66 (18.9)	75 (23.9)	—
Av 31.56 Av (23.33)	2332 Av (13.53)	2.336 Av (0.844)	0.519 Av (0.314)	13.51 Av (2.461)	175 Av (79.4)	66 Av (18.8)	75 Av (23.9)	29.12 Av (98.32)

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank shaft speed rpm	Ship rpm	Fuel Consumption			Temp (°C)			Barom. in. (kPa)
					gal/hr (L/h)	B/hp hr (kg/kW h)	Hp-hr/gal (kW h/L)	Cool med	Air wet bulb	Air dry bulb	
Maximum Available Power — Two Hours 7th (2H) Gear											
51.28 (38.24)	5235 (14.18)	5.95 (9.57)	2201 (13.637)	5.06 (1.921)	0.489 (0.292)	14.56 (2.628)	185 (83.9)	74 (23.1)	81 (26.9)	28.98 (97.86)	
75% of Pull at Maximum Power — Ten Hours 7th (2H) Gear											
41.67 (31.07)	2485 (17.04)	6.29 (10.13)	2296 (14.18)	3.76 (1.346)	0.504 (0.307)	13.90 (2.738)	182 (83.3)	72 (22.3)	85 (29.3)	28.74 (97.05)	
50% of Pull at Maximum Power — Two Hours 7th (2H) Gear											
28.66 (21.37)	1650 (11.74)	6.51 (10.48)	2347 (15.08)	2.56 (0.948)	0.569 (0.346)	12.53 (2.426)	180 (81.9)	76 (24.2)	89 (26.1)	28.90 (97.39)	
50% of Pull at Reduced Engine Speed — Two Hours 8th (3H) Gear											
28.67 (21.38)	1650 (11.74)	6.52 (10.49)	1985 (12.932)	2.53 (0.929)	0.488 (0.292)	14.56 (2.628)	179 (81.7)	75 (23.6)	84 (26.9)	28.96 (97.78)	

MAXIMUM POWER IN SELECTED GEARS

45.54 (33.27)	6356 (28.27)	2.57 (4.11)	2267 (14.18)	4th (4L) Gear	180 (81.9)	69 (20.6)	72 (22.2)	28.76 (97.12)
50.21 (37.44)	5158 (22.94)	5.65 (9.07)	2202 (13.637)	5th (5L) Gear	182 (83.3)	68 (20.0)	70 (21.1)	28.94 (97.73)
52.10 (38.85)	4572 (33.45)	4.47 (7.18)	2209 (14.18)	6th (6H) Gear	181 (82.8)	69 (20.6)	71 (21.1)	28.94 (97.73)
52.52 (38.94)	5311 (24.23)	5.95 (9.57)	2205 (13.637)	7th (2H) Gear	182 (83.3)	71 (21.3)	75 (23.9)	28.96 (97.79)
51.78 (38.61)	2506 (18.26)	8.42 (13.55)	2199 (13.55)	8th (3H) Gear	182 (83.3)	72 (22.2)	77 (25.0)	28.96 (97.79)

Department of Agricultural Engineering

Dates of Test: August 23 to September 6, 1985.

Manufacturer: AGROZET ZETOR, Brno 63200, Czechoslovakia

FUEL, OIL AND TIME: Fuel No. 2 Diesel Cetane No. 46.9 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60°F (15°/15°C) 0.8425 Fuel weight 7.013 lb/gal (0.840 kg/l) Oil SAE 15W-40 API service classification SE, SF, CC, CD To motor 2.841 gal/(10.753 l) Drained from motor 2.567 gal (9.716 l) Transmission and final drive lubricant SAE 80W gear lubricant Total time engine was operated 31.5 hours.

ENGINE: Make Zetor Diesel Type four cylinder vertical Serial No. 7201 008344 K Crankshaft lengthwise Rated rpm 2200 Bore and stroke 4.02" × 4.33" (102 mm × 110 mm) Compression ratio 17 to 1 Displacement 219 cu in (3596 ml) Starting system 12 volt Lubrication pressure Air cleaner oil bath with centrifugal pre-cleaner Air compressor direct engine drive Oil filter full flow centrifugal Fuel filter two paper elements and sediment bowl Muffler vertical Cooling medium temperature control one thermostat.

CHASSIS: Type front wheel assist Serial No. 7245 006440 Tread width rear 56.1" (1425 mm) to 70.9" (1800 mm) front 59.4" (1510 mm) to 70.5" (1783 mm) Wheel base 87.5" (2222 mm) Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 55.9" (911 mm) Vertical distance above roadway 37.0" (940 mm) Horizontal distance from center of rear wheel tread 0" (0 mm) to the right/left Hydraulic control system direct engine drive with throwout lever Transmission selective gear fixed ratio Advertised speeds mph (km/h) first 1.2 (1.9) second 1.5 (2.4) third 2.1 (3.4) fourth 3.0 (4.8) fifth 4.1 (6.6) sixth 4.9 (7.9) seventh 6.4 (10.3) eighth 9.0 (14.4) ninth 12.8 (20.5) tenth 17.5 (28.1) reverse 1.6 (2.5), 6.6 (10.6) Clutch single dry disc operated by foot pedal Brakes drum and shoe hydraulically operated by two foot pedals which can be locked together Steering power assist Turning radius (on concrete surface with brake applied) right 165° (4.2 m) left 165° (4.2 m) on concrete surface without brake) right 185° (4.7 m) left 185° (4.7 m) Turning space diameter (on concrete surface with brake applied) right 343" (8.7 m) left 343" (8.7 m) on concrete surface without brake) right 390" (9.9 m) left 390" (9.9 m) Power take-off 540 rpm at 1995 engine rpm and 1000 rpm at 2050 engine rpm Unladen tractor mass 7660 lb (3475 kg)

LUGGING ABILITY IN 7th (2H) GEAR

Crankshaft Speed rpm	2205	1981	1765	1541	1324	1104
Pull—lb (kN)	5511 (14.73)	5428 (15.23)	5524 (15.68)	5558 (15.64)	5517 (15.64)	5549 (14.90)
Increase in Pull %	0	4	6	7	6	1
Power—Hp (kW)	52.52 (39.16)	49.80 (36.39)	44.57 (32.24)	39.52 (29.32)	35.46 (26.93)	26.57 (19.82)
Speed—Mph (km/h)	5.95 (9.57)	5.34 (8.59)	4.74 (7.63)	4.14 (6.67)	3.57 (5.74)	2.98 (4.79)
Slip %	5.17	5.31	5.45	5.45	5.45	5.31

Front Wheel Drive Disengaged Engaged

TRACTOR SOUND LEVEL WITH CAB	dB(A)	dB(A)
Maximum Available Power—Two Hours	85.0	84.0
75% of Pull at Maximum Power—Ten Hours	85.0	85.0
50% of Pull at Maximum Power—Two Hours	85.0	85.0
50% of Pull at Reduced engine Speed—Two Hours	80.0	80.0
Bystander in 10th (5H) gear	87.5	87.5

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lb (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption			Temp °C			Barom in. Hg (kPa)
					gal/hr (L/h)	B/hp hr (kg/kW h)	Hp gal (kW L)	Cool- ing med	Air wet bulb	Air dry bulb	
MAXIMUM AVAILABLE POWER — Two Hours 7th (2H) Gear											
49.66 (37.04)	5256 (14.18)	5.76 (9.26)	2201 (13.637)	8.61 (13.467)	3.558 (0.306)	0.502 (2.750)	185 (83.9)	72 (22.2)	82 (27.5)	28.68 (96.81)	
MAXIMUM POWER IN SELECTED GEARS											
45.11 (33.64)	4768 (21.30)	5.53 (8.89)	2259 (13.637)	14.91 (15.69)	5th (5L) Gear			181 (82.5)	69 (20.6)	77 (25.0)	28.65 (96.75)
50.77 (37.86)	5311 (14.73)	5.75 (9.23)	2200 (13.637)	8.68 (13.467)	7th (2H) Gear			181 (82.8)	71 (21.3)	74 (23.9)	28.95 (97.76)

TIRES, BALLAST AND WEIGHT

Base Tires	Ballast	With Ballast		Without Ballast	
		Two 16.9/14.54, 8, 24 (165)	Two 16.9/14.54, 8, 24 (165)	Two 16.9/14.54, 8, 24 (165)	Two 16.9/14.54, 8, 24 (165)
—No. size, ply & psi (kPa)	—None	None	None	None	None
—Liquid (trach)	310 lb (141 kg)	None	None	None	None
—Cast (iron trach)	52 lb (24 kg)	None	None	None	None
Height of Drawbar	27 in (685 mm)	27 in (685 mm)	27 in (685 mm)	27 in (685 mm)	27 in (685 mm)
Static Weight with Operator—Rear	5995 lb (2402 kg)	4675 lb (2120 kg)	3165 lb (1439 kg)	7640 lb (3466 kg)	7640 lb (3466 kg)
—Front	3270 lb (1487 kg)	3165 lb (1439 kg)	3165 lb (1439 kg)	3165 lb (1439 kg)	3165 lb (1439 kg)
—Total	8565 lb (3889 kg)	7840 lb (3556 kg)	7840 lb (3556 kg)	7840 lb (3556 kg)	7840 lb (3556 kg)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi (kPa)	2425 (16720)	
Location	remote outlet	
Hydraulic oil temperature °F (°C)	193 (89)	
Location	pump inlet	
	Maximum Lift Capacity	Lift Capacity for Transport
QUICK ATTACH	no	
CATEGORY	II	*not measured
LOAD lbs (kg)	4698 (2131)	
TIME sec	3.51	
HITCH POINT MOVEMENT in (mm)		
Lowest position	12.1 (307)	
Top of timed range	36.1 (917)	
Highest position	56.8 (933)	
LOAD CG MOVEMENT in (mm)		
Lowest position	11.5 (287)	
Top of timed range	36.7 (932)	
Highest position	57.7 (958)	

*Implement load capacity for transport purposes not specified by manufacturer

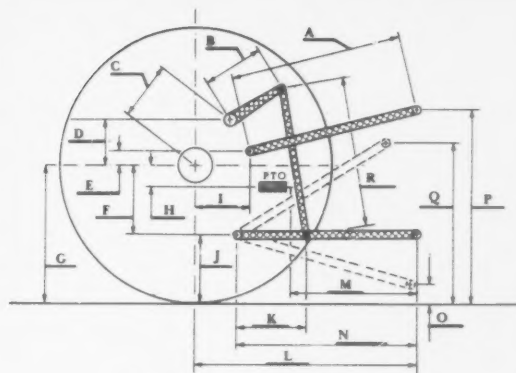
REPAIRS AND ADJUSTMENTS: An "O" ring in the power steering pump was replaced following the 10 hour drawbar test.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 152°F (66.7°C). Five gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1572, October 25, 1985.

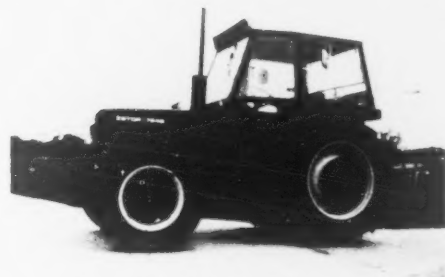
LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers



Hitch Dimensions as Tested — No Load

	inch	mm
A	25.5	648
B	12.6	320
C	14.3	364
D	14.3	363
E	12.7	323
F	5.4	138
G	29.7	754
H	0.3	7
I	11.3	288
J	24.3	616
K	15.8	401
L	57.0	940
M	26.7	677
N	33.8	857
O	8.0	203
P	43.3	1100
Q	35.8	908
R	21.8	552



Zetor 7245 Diesel

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Irvin T. Omtvedt, Dean and Director



Implement & Tractor

The business magazine of the farm and industrial equipment industry

APRIL 1986

Starting our second 100 years:

Let's Look Beyond

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ANDREA SCHWARZ SRI
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Meet a Pair of Century-Old Dealerships Page 32



Implement & Tractor

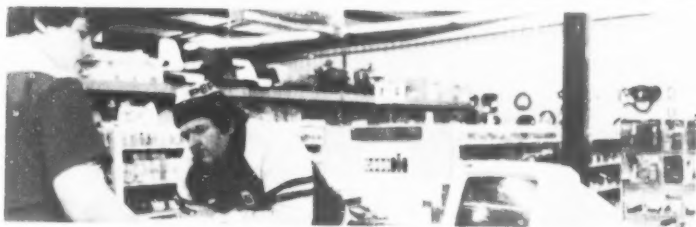
The business magazine of the farm and industrial equipment industry.

April 1986 • Vol. 101 • No. 6

Let's Look Beyond!

To prepare this 100th Anniversary special issue of I&T and kick off the magazine's second century, Editor Bill Fogarty asked some of the industry's brightest thinkers to share their visions of the future:

- 10: **Ray Dague:** As long as the dealer adds value...
- 12: **Dr. Lavon S. Fife:** Consolidations don't assure viability
- 12: **Emmett Barker:** Superfarm age? We're already there.
- 14: **Walter Vogel:** Dealers will need 'application engineers.'
- 16: **Tom Scott:** We aim to be the farmer's supermarket.
- 18: **Sam White:** Ascendancy of the independent dealer.
- 20: **Ray Koenig:** More varied, responsive dealers.
- 23: **Wade Newbegin:** The present distribution system will continue.
- 24: **Ed Walsh:** The bad dream (shop losses) won't go away.
- 26: **John Conrads:** Dealers and perceived reliability.
- 29: **The Parts Expert:** We can take some of that auto-truck parts market.



- 32: **Into Their Second Centuries.** Two immigrants from Germany came to Nebraska and founded dealerships in the 1880s. Their descendants have kept them going and prospering since then, and it's all history now. Longevity won't assure survival in today's climate, but management and planning will.
- 38: **How Dealers Are Changing Their Lines.** A report on the I&T For Dealers Only survey in which 193 dealers told what they handle and what they're planning to add and drop.

On the cover...As I&T passes its century mark, it's an appropriate time to look beyond the everyday concerns of this business and into its future.

DEPARTMENTS

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Why the Big Sales Jump in February?

After many lackluster months in which the only bright news was continuing improvement in sales of under-40-hp tractors from Japan,

February retail unit volume showed increases in all product areas except forage harvesters.

One reason offered to I&T from dealer ranks: One of the

major companies required that a substantial number of its dealers take machines into their rental fleets—whether they had rental operations or not.

	Unit Retail Sales					
	February	Pct.	Change	January-February	Pct.	Change
	1986	1985		1986	1985	
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	2,460	2,187	+ 12.5	5,609	4,649	+ 20.6
40-99 hp	1,772	1,711	+ 3.6	4,226	4,450	- 5.0
100-139 hp	596	350	+ 70.3	1,006	1,238	- 18.7
Over 140 hp	696	557	+ 25.0	1,884	1,685	+ 11.8
Total 2-wheel drive	5,524	4,805	+ 15.0	12,725	12,022	+ 5.8
4-wheel drive						
Under 200 hp	41	36	+ 13.9	111	131	- 15.3
Over 200 hp	80	78	+ 2.6	284	220	+ 29.1
Total 4-wheel drive	121	114	+ 6.1	395	351	+ 12.5
Total All Tractors	5,645	4,919	+ 14.8	13,120	12,373	+ 6.0
S-P Combines	191	171	+ 11.7	813	913	- 11.0
Balers (under 200-lb. bales)	151	133	+ 13.5	400	439	- 8.9
Forage Harvesters						
(shear-bar type)	35	56	- 37.5	122	170	- 28.2
Mower-Conditioners	195	192	+ 1.6	620	672	- 7.7

Hesston: Brenneman Is Out; President's Job to Mario Chessa

Howard Brenneman, president and chief executive officer of Hesston Corp., resigned Mar. 12 at a meeting in Paris, France, of the executive committee of the board of directors.

Mario Chessa, who had recently been named executive

vice-president, commercial, was elected president and chief executive officer and appointed to fill Brenneman's vacancy on the board.

Other changes: Richard Hrdlicka, senior vice-president and general counsel, was given the additional job of vice-chairman of the board. Fred Scharer, vice-president, Woods Div., became executive vice-president, Woods Div.

MF Launches Club For Customers

Massey-Ferguson Inc. has launched the MF Club—open to owners of MF tractors, combines, balers, swathers and new implements.

Benefits include the opportunity to charge parts and service at participating MF dealers with the Sears Discover

card, group insurance programs, travel services, discounts, clothing and other merchandise.

MF's Glenn Christians, who is managing the launch of the club, said that members will have access to a hotline which will be available to provide assistance in product and related matters. Annual membership fee is \$25.

Briefly...

Walsh Mfg. Co., Charles City, Ia., has been bought by Richard Grunewald, its president, and Art White, its sales vice-president. New name for the company is Cedar Valley Products, but the Walsh brand

name and most Walsh products will continue.

Mark Zimmerman has been named editor of *Agricultural Engineering*, published by the American Society of Agricultural Engineers, St. Joseph,

Ford-New Holland Deal: Phase One Is Completed

Ford Tractor Operations has completed the first phase of the deal by which Ford Motor Co. is acquiring New Holland from Sperry Corp. for Ford Tractor Operations.

The first phase covers four countries—the U.S., Canada, Belgium and Spain. This part of the acquisition includes Ford payment of \$254 million in cash plus the assumption of \$78 million in liabilities. The total transaction is to involve payment of \$330 million and assumption of \$110 in liabilities.

The rest of the deal is expected to be closed in stages between the end of March and September.

Mich. Before his 16-year career as a staff editor for *Machine Design* magazine, Zimmerman was I&T's engineering editor.

U.S. farmers are using no-till techniques on 19.2 million acres this year, an increase of 7

Canadian Sales: Tractor Volume in Similar Big Jump

February flash numbers from the Canadian Farm & Industrial Equipment Institute reflected even stronger jumps in tractor sales of some brackets, and perhaps for the same reason.

February tractor sales were up 56 per cent from 836 to 1,307 units. The biggest jump was in two-wheelers—from 187 to 547 units. For the year, total tractor sales were up 27 per cent from 2,006 units to 2,557.

Dealer sources told I&T that one manufacturer offered special discounts to dealers on late new units if older new units were moved, including into rental status, and that some dealers took the deal.

NFPEDA: Reno Meeting in 1986, Milwaukee in '87

The 1986 convention of the National Farm & Power Equipment Dealers Assn. is set for Aug. 24-28 at the MGM Grand at Reno, Nev.

Agritech 86, a trade show, will be held in conjunction with the convention at the same site. Andry Montgomery of Louisville, Ky., is organizer of the show.

For 1987, the convention and show are scheduled for Aug. 2-6 in Milwaukee. The Hyatt Regency and Marc Plaza hotels are sites for the convention and the MECCA exhibition facility for the show.

For further information about the convention, contact Jim Whitfield, NFPEDA, 314/821-7220; about the show, contact Marsha Woods, Andry Montgomery, 502/582-1672.

per cent, according to *No-Till Farmer*. A state-by-state, crop-by-crop survey report on tillage practices is available for \$100 from the publication at Box 624, Brookfield, Wis. 53008-0624.

Dickey-john Corp., producer of farm equipment electronic components, had sales in the first six months of fiscal 1986 (ended Dec. 31) of \$17.3 million, compared with \$19.1 million in the same 1985 period. Earnings, however, rose substantially from \$75,000 to \$600,000 for the six months.

How Dealers Are Changing Their Lines

By Scott Nesbitt

■ **DEALERS MAKE** lousy converts to the One-Line Gospel being preached by major farm machinery manufacturers.

That Gospel tells dealers their loyalty to one brand brings profit everlasting, and urges (within the limits of the law) that dealers cast out their off-color product lines.

Judging from the 193 returns received in the For-Dealers-Only survey on "Your Important Line Changes," the dealers are intent on sinning in the eyes of their majors.

The survey found that 80 of the dealers (41 per cent) carried two lines of tractors in 1985, and 105 other dealers, who were one-liners in 1985, had plenty of evil thoughts about adding another tractor line in 1986.

Yet it also found that both one-line and multi-line dealers were generally thinking of reducing the number of shortlines they carry in 1986, after having increased their shortline offerings between 1980 and 1985.

The table on "What Dealers Carry, Might Add or Drop" summarizes the responses received to the survey, which ran in the January, 1986, issue of *Implement & Tractor*. The survey asked dealers what they might add or drop, and doubtless some dealers checked some "might drop" boxes to describe situations where they were *being* dropped.

A second table, the "Box Score on Multi-Brand Dealers," shows how the 80 who now have two or more tractor lines have changed their of-

ferings between 1980 and 1985, and projects a slight downturn in line-mixing for 1986. The box score did not include infrequently-mentioned brand names, which were included in the larger table, so the column totals disagree.

The merger scene

The recent wave of manufacturer consolidations seems to have generated several patterns among the 105 dealers we called one-liners.

Among the 20 Ford dealers, for example, were eight who said they might add New Holland in 1986, reflecting that recent manufacturer consolidation. In another group of eight dealers who had no tractors in 1985 were two who carried New Holland, and both might add Ford in 1986.

That merger apparently benefited the manufacturers, but there were other cases where mergers don't seem as well received by dealers.

In the multi-line box score, for example, were 22 dealers who carried Deutz-Allis in 1985, and six of those might drop the line in 1986. Among the 27 multi-liners who had Case-IH in 1985 were four who might drop the line in 1986, though net loss of sales outlets would be only two since two other dealers might take on that line.

Again, these 1986 changes won't necessarily happen, and might reflect some dealers who expect to be dropped, not dealers dropping the lines they named.

Yet, the survey shows a lot of turbulence at the dealer level, meaning manufacturers will have to redouble efforts to keep their existing dealers happy. That applies especially to shortline manufacturers, who seem to be slipping in total number of sales outlets.

The big get bigger

Thumbing through the 193 cards revealed a pattern that's illustrated by the 36 Case-IH dealers: They might drop 11 shortlines while ad-

Box Score on Multi-Brand Dealers

The FDO "Line Changes" survey identified 80 dealers who carried more than one tractor line in 1985. Brand names mentioned less than twice are not included, so totals disagree with the summary table.

Tractor Line	Number of Multi-line Dealers Handling that Line			
	Carried In 1980	Carried In 1985	Might Add (+) Drop (-) Line In 1986	Result For 1986
Case-IH	IH → 20 Case → 14	27	+2 -4	25
Deere	4	6	+2 -1	7
Deutz-Allis	Allis → 17 Deutz → 5	22	+0 -6	16
Fiat-Hesston		8	+0 -2	6
Ford	14	21	+4 -1	24
Kubota	14	27	+5 -2	30
Long	7	7	+0 -1	6
Massey-Ferguson	12	6	+3 -1	8
Mitsubishi	3	3	+0 -0	3
SAME	3	2	+0 -1	1
Steiger	10	15	+2 -2	15
Versatile	9	6	+0 -3	3
White Farm	18	16	+2 -2	16
Zetor	0	2	+0 -0	2
Total for 80 dealers	150	188	+20 -26	162

ding 13 new tractor lines, including four for Ford, three for Kubota, and one each for Deere, Deutz-Allis, Massey-Ferguson, Steiger, Versatile and White Farm.

Another example is the 20 Ford dealers, who might add nine new shortlines, of which eight are New Holland, which means only one new shortline that falls outside the manufacturer's system. Against that one "real" shortline addition are six shortlines that might be dropped, for a net loss of five shortlines at Ford dealerships in 1986.

All told, there were 15 Ford dealers who might add New Holland, and deducting those 15 from the projected total of 318 shortlines for 1985 drops overall shortline sales outlets back to 303, exactly the number found in 1980.

But perhaps it's not all that grim. The survey named only seven shortlines, requiring dealers to write in the 52 other names that were mentioned.

Because the survey card stressed our interest in lines considered im-

portant by the dealers, it's likely we didn't pick up all the lines each dealer handled. Odds are good that a dealer who was planning to drop a particular line would have that name on his mind and forget other lines he handled, especially when filling out a survey about changes in his product offerings.

Another run through the cards showed another interesting pattern. Of the 193 dealers, only 24 carried a single brand of products in 1985, and 19 of the 24 said they might add one or more other lines in 1986. That would convert them from one-line adherents into the multi-line camp, and multi-line dealers seem comfortable handling lots of different brands.

If that's a valid trend, it would indicate a future in which most dealers run machinery "supermarkets," with room on their lots for several manufacturers. That offers little comfort for the preachers of the One-Line Gospel, but might lend some moral support for dealers who feel like straying from the doctrine.

The summaries presented here might whet the appetites of many readers, but we've run out of space to list things like the tractor lines most likely to be added or dropped, and the names of shortlines most mentioned by the dealers. So here's a...

Special Offer!

If you want more on the line changes survey, put your request, plus your mailing address, in a letter to Implement & Tractor, Editorial Dept., P.O. Box 12901, Overland Park, KS 66212. Enclose \$2 to cover duplication and mailing costs, and we'll send you a 12-page (or more) report, that will include any dealer responses not received by publication deadline.

And dealers, don't forget there's another For Dealers Only survey inside the front cover of this month's I&T. Take a minute, fill it out, and drop it in the mail. If you have any suggestions for topics FDO should cover, please jot a note on the survey. □

What Dealers Are Carrying, Adding and Dropping

Table summarizes 193 dealers' responses to an FDO survey on "Your Important Line Changes" from the January, 1986, Implement & Tractor magazine. While the data are meaningful, the self-selection and mail-in survey method do not produce statistical significance.

Type of Dealer (By full line carried in 1985)	Number in Group	Tractor Sales Outlets				Shortline Sales Outlets			
		Lines Carried in 1985	Lines Carried in 1986	Might Add (+) New Line Drop (-) Old Line in 1986	Resulting Lines Carried in 1986	Shortlines Carried in 1985	Shortlines Carried in 1986	Might Add (+) A Line Drop (-) A Line in 1986	Resulting Shortlines in 1986
Case-IH	36	40	36	+13 -0	49	66	61	+2 -11	52
Deere	23	23	23	+2 -0	25	25	24	+1 -8	17
Ford	20	20	20	+3 -0	23	42	46	+8 -6	49
Deutz-Allis	13	15	13	+1 -1	13	15	17	+3 -2	18
Massey-Ferguson	7	9	7	+1 -1	7	7	10	+3 -1	12
White Farm	6	5	6	+1 -2	5	11	11	+1 -0	12
Sub-total	105	112	105	+21 -4	122	166	169	+16 -28	160
Two full lines or more	34	73	79	+13 -16	76	61	69	+5 -7	67
One full line plus partials	46	81	99	+8 -11	96	62	75	+12 -11	76
No full tractor line	8	4	0	+4 -0	4	14	12	+3 -0	15
Sub-total	88	158	178	+25 -27	176	137	156	+20 -18	158
Total — all dealers	193	271	283	+46 -31	297	303	325	+36 -46	318

Auction Prices

Asterisk beside price indicates highest bid offered on tractors that were not sold.

JONES FARM EQUIPMENT CO. Dothan, Ala.

Jan. 24 & Feb. 11, 1986

ALLIS-CHALMERS TRACTORS

7030, 1974 (Good)	6000*
5020, 1978 (Good)	3000
6080, 1982 (Excellent)	7200

CASE TRACTORS

1570, cab, duals, 1976 (Fair)	4200
1070 diesel, 1976 (Good)	3100*
970, 1970 (Good)	5000

DAVID BROWN TRACTOR

885, 1978 (Excellent)	3400
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FORD TRACTORS

Dexta, 1962 (Fair)	1000
Dexta, 1958 (Fair)	1350
9N, 1941 (Good)	1000
901, Select-O-Speed, 1958 (Fair)	950*
841, 1956 (Rough)	1875*
801, 1957 (Good)	2100
7600 diesel, canopy 1976 (Good)	4400*
7000, 1976 (Fair)	3700
7000, 1973 (Rough)	3000
6600, 1980 (Excellent)	6400
5000, 1969 (Fair)	3600
5000 diesel, 1967 (Good)	5300*
5000 diesel, 1967 (Rough)	2975
5000, 1965 (Rough)	3750
5000, 1965 (Good)	3900*

4000, 1965 (Good)	3900*
4000, (Good)	4200*
4000 diesel, (Fair)	1700
4000 diesel, 1970 (Good)	3000
4000 diesel, 1970 (Good)	3500
4000, 1966 (Fair)	2750
3000 diesel, 1974 (Good)	2900
3000 diesel, 1974 (Good)	2950
3000, 1972 (Good)	3650
3000 diesel 1971 (Fair)	2450
3000 diesel, 1970 (Fair)	2600
3000 diesel, 1970 (Fair)	3000
3000 diesel, 1968 (Fair)	2950
3000 diesel, 1967 (Excellent)	4100
3000, 1966 (Fair)	2600
3000, 1965 (Fair)	3100
3000 diesel, 1965 (Good)	3500
2600 diesel, 1978 (Good)	4900*
2000, 1974 (Good)	2000
2000, 1971 (Excellent)	3600*
2000, 1965 (Good)	2100*
2000 diesel, 1965 (Excellent)	3600

MASSEY-FERGUSON TRACTORS

1155, 1973 (Good)	4500*
1130, 1975 (Good)	5500
1085, 1974 (Good)	4300
282, 1984 (Excellent)	7500*
265, 1976 (Excellent)	4800
255, 1975 (Excellent)	4400
245, 1977 (Good)	4075
175 diesel, 1973 (Rough)	2500*
175 diesel, 1968 (Good)	3900
175 diesel, 1964 (Rough)	2400*
165, 1965 (Fair)	2350
165, 1964 (Fair)	3650

165 diesel, 1964 (Rough)	2050
150, 1958 (Fair)	1450
135 diesel, 1974 (Good)	2850
135, 1967 (Fair)	2750*
35, 1960 (Good)	1700
35, 1958 (Rough)	1850

INTERNATIONAL HARVESTER TRACTORS

B414 diesel, 1968 (Good)	1100
1586, 1978 (Fair)	7000
1586 diesel, cab, 1976 (Rough)	5000
966 diesel, 1973 (Good)	3800
886 diesel, canopy, 1977 (Good)	4400*
784 diesel, cab, 1983 (Good)	6000
784 diesel, cab, 1980 (Good)	5800*
784 diesel, cab, 1979 (Good)	5800*
784 diesel, canopy, 1978 (Good)	6400*
784 diesel, cab (Excellent)	4800*
674 diesel, 1977 (Excellent)	3500*
674 diesel, 1976 (Excellent)	3800*
674 diesel, canopy, 1975 (Good)	3550
674 diesel, cab, 1974 (Good)	4250*
674 diesel, cab, 1974 (Excellent)	4600*
666, 1972 (Good)	3800*
Cub, mo., 1949 (Good)	1075
Cub, 1948 (Rough)	150*
Cub, 1947 (Fair)	1000
574 diesel, cab, 1978 (Good)	5000*
574 diesel, cab, 1977 (Excellent)	4500*
574 diesel, 1976 (Good)	4000
574 diesel, 1975 (Good)	4300*
574 diesel, canopy, 1973 (Good)	4400*
574 diesel, 1970 (Good)	4000*
544 diesel, 1969 (Good)	3400
544 diesel, 1968 (Good)	3400

484 diesel, cab, 1978 (Excellent)	5400*
454 diesel, 1973 (Excellent)	4100
454 diesel, canopy, 1973 (Excellent)	4300*

JOHN DEERE TRACTORS

4840 diesel, duals, cab, 1978 (Excellent)	22,000
4520 diesel, canopy, 1969 (Good)	3850
4020 diesel, 1969 (Good)	3500
3130 diesel, 1965 (Good)	6100*
3120, 1966 (Good)	2700
2940, 1980 (Good)	8100
2750 diesel, 1983 (Excellent)	9000
2640, 1976 (Good)	4100
2130 diesel, cab, 1976 (Excellent)	6300*
2130 diesel, 1977 (Good)	4700
2130 diesel, 1975 (Good)	4500*
2130 diesel, cab, 1973 (Good)	6100*
2130 diesel, cab, 1973 (Good)	6250*
2030 diesel, 1974 (Good)	4400*
2030 diesel, 1974 (Good)	4800*
2030 diesel, 1973 (Good)	4300*
2030, 1972 (Excellent)	4000*
2020, 1968 (Good)	3600
2010, 1963 (Rough)	1400
1120 diesel, 1973 (Fair)	3200*
1020, 1965 (Good)	2500*

LONG TRACTOR

445, (Good)	1900
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OLIVER TRACTORS

1355 diesel, 1971 (Good)	1500
1650 diesel, 1966 (Fair)	2250

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YODER & FREY, INC.
Archbold, Ohio
February 11, 1986

**INTERNATIONAL HARVESTER
TRACTORS**

A, cult., 1950 (Fair)	925*
A, cult., 1950 (Rough)	850
Cub 154, 1974 (Fair)	2100
Cub 154, 1973 (Fair)	1800*
Sup-A, cult., 1954 (Fair)	1400*
H, ldr.,	450
H, 1944 (Rough)	440
H, 3-pt. 1946 (Fair)	925*
H, 1951 (Fair)	600*
H, 19' 8" (Fair)	650
H, 19' 3" (Fair)	420*
H, 1950 (Fair)	550*
M, 1948 (Fair)	625*
M, 1945 (Rough)	550*
M, 1949 (Rough)	575*
M, 1947 (Fair)	700*
M, 1949 (Fair)	700*
Sup. M, 1953 (Good)	900*
Sup. M, 1954 (Fair)	675*
Sup. C, mo., 1954 (Fair)	700*
Sup. C, 1953 (Fair)	775*
100, cult., 1955 (Fair)	1550*
100, cult., 1955 (Fair)	1400*
300, 1957 (Fair)	750
354, 1972 (Fair)	2950
400, 1956 (Fair)	900*
2404, ldr., 1963 (Rough)	2300
480 diesel, 1961 (Rough)	1050*
504 diesel, 1967 (Fair)	2700*
504, 1975 (Fair)	1850
560 LP, 1959 (Fair)	1300
644 diesel, 1973 (Good)	5700*
656, 1970 (Fair)	2800
656 diesel, 1970	3550
666, 1974, (Good)	4300*
666 diesel, 1974 (Good)	5700*

674, ldr., 1975 (Good)	6700*
706, 1964 (Rough)	3300
706 diesel, 1964 (Fair)	2000*
706, 1964 (Fair)	2300*
756 diesel, 1970 (Good)	6250
756, 1967 (Good)	4050*
756, 1968	4400
766, 1970 (Rough)	3100*
766, 1974 (Fair)	5000*
766, 1974 (Fair)	5250*
806, 1964 (Good)	3650
806 diesel, 1965 (Good)	3600*
806 diesel, 1967 (Fair)	3300*
806 LP, 1965 (Rough)	1750*
806, 1965 (Fair)	2700*
806 diesel, 1965 (Fair)	4600
806 diesel, 1963 (Fair)	4800*
806 diesel, 1965 (Fair)	3500*
826, 1970 (Fair)	4475
826, 1970 (Fair)	4400*
826 diesel, 1970	4400*
856 diesel, 1970 (Good)	5100*
856 diesel, 1970 (Fair)	4750*
856 diesel, 1970 (Good)	5000*
856 diesel, 1968 (Good)	4500*
966 diesel, 1973 (Good)	5500*
966, 1973 (Fair)	5500*
966, 1974 (Fair)	6000
966 diesel, 1975 (Fair)	4500*
1066 diesel, 1975 (Good)	6250*
1066, 1975 (Fair)	6100*
1066, 1975 (Good)	6500*
1066 diesel, 1975 (Excellent)	7800*
1066 diesel, 1974 (Good)	7300*
1066 diesel, 1974 (Fair)	5350
1066 diesel, 1974 (Fair)	5400*
1066 diesel, 1978 (Good)	9100*
1206, 1965 (Fair)	3850*
1256 diesel, 1969 (Fair)	2900*
1256, 1970	3100*
1256, 1970 (Good)	4800*
1466, 1953 (Rough)	750
1466 diesel, 1975 (Good)	5100*
1466, 1972 (Good)	6200*

1466, 1975	6800*
1456 diesel, 1970 (Fair)	6000*
1566, 1971 (Good)	7300*
1586 diesel, 1977 (Fair)	9600*
1586, 1978 (Fair)	7100*

FORD TRACTORS

8N, 1950 (Fair)	800*
8N, 1952 (Fair)	1300*
8N, 1947	1100
8N, 1948 (Fair)	1150*
8N, 1950 (Fair)	1450
8N, ldr., 1952 (Fair)	1575*
9N, 1943 (Fair)	925
9N, 1951 (Fair)	950
9N, 1944 (Fair)	850*
9N, 1943 (Rough)	700
9N, 1944 (Rough)	800*
9N, 1942 (Rough)	750*
600, 1958 (Rough)	1850
841, 1957	1950*
3000 diesel, 1969 (Fair)	2700*
4000, 1965 (Fair)	2950*
5000 diesel, 1972 (Good)	5300
5000 diesel, 1974 (Good)	4800*
5000 diesel, 1965 (Rough)	2900*
5000, 1968 (Fair)	4700*
7000 diesel, 1972 (Fair)	5900*
6700, 1977 (Good)	6550*
9700, 4WD, 1978	7850*
Jub., ldr., 1954 (Fair)	2200*

DEUTZ TRACTORS

D6006, (Fair)	4500*
D10006, (Fair)	5000*

ALLIS-CHALMERS TRACTORS

B, mo., 1948 (Fair)	1500
WD-45, 1953 (Rough)	750
WD-45, 1954 (Fair)	550
WD-45, 1955 (Fair)	775
D-17, 1966 (Fair)	1000
D-17, 1967 (Fair)	1900*
D-21, 1967 (Fair)	2300*

185 diesel, 1976 (Fair)	3450
190 diesel	2250
190XT diesel, 1970 (Fair)	3300*
190XT, 1968 (Good)	2700
7000, 1977 (Fair)	6200*
7060, 1977 (Good)	7750
7060, 1976 (Fair)	8400
7060, 1975 (Fair)	8600
7580 diesel, 1979 (Good)	9500*

OLIVER TRACTORS

1850 diesel, ldr., 1966 (Good)	5000*
1650 diesel, 1965 (Good)	2500*
1755 diesel, 1973 (Fair)	2700
1850 diesel, 1966 (Rough)	1900*
1850 diesel, 1967 (Fair)	2500*
1850, 1936 (Fair)	1950*
1855 diesel, 1973 (Good)	4100*
1855 diesel, 1973 (Good)	4000*

WHITE TRACTORS

2-70 diesel, 1978 (Good)	4900*
4-150, 1975 (Fair)	5650

JOHN DEERE TRACTORS

A, 1949 (Fair)	200*
B, 1946 (Fair)	500*
B, 1950 (Rough)	600
50,	500
60, 1956 (Fair)	1025
60, 1954 (Fair)	950*
60, ldr., 1955 (Fair)	1200*
530, 1957 (Good)	1500*
720 diesel, 1957 (Fair)	1000*
1520, ldr., 1971 (Good)	5150*
2440 diesel, 1978 (Fair)	5800*
2840 diesel, ldr., 1978 (Good)	9000*
3010 diesel, 1962 (Fair)	2800*
3020, 1965 (Good)	4500*
3020, 1967 (Fair)	2200*
3020, 1967 (Good)	3100
4010 diesel, 1963 (Fair)	3400

(More...)



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FOR TOUGH TIMES.**



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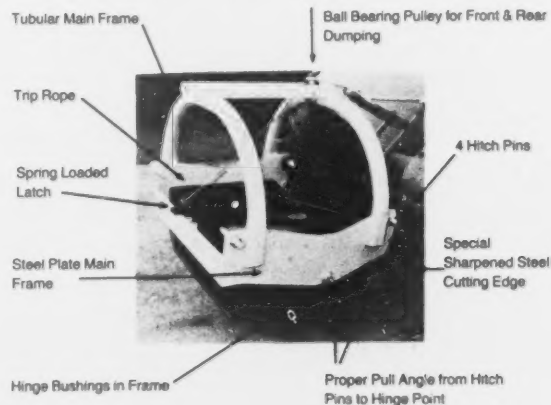
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Auctions

(continued)

4010 diesel, 1962 (Good)	4300*	4030 diesel, 1974 (Good)	9100*	65 diesel, 1961 (Rough)	1025	VC, 1949 (Rough)	235
4010	2650	4230 diesel, 1974 (Good)	8800	65 diesel, 1960 (Fair)	2000	930 diesel, 1965 (Fair)	2900*
4010 diesel, 1961 (Fair)	3200	4320, 1971 (Good)	4350*	65 diesel, 1960 (Fair)	1600	930 diesel, 1962 (Fair)	1250
4010 diesel, 1963 (Fair)	3100*	4320, 1972 (Good)	7300*	85, 1960 (Good)	1300*	970, ldr., 1971 (Fair)	6500*
4010 diesel, 1962 (Good)	3200*	4430 diesel, 1977 (Excellent)	12,250*	Sup. 90 diesel, 1962 (Good)	1600*	1070 diesel, 1976 (Fair)	4200
4010 diesel, 1961 (Fair)	3800*	4430 diesel, 1973 (Good)	11,500*	135 diesel, 1970 (Rough)	2400*	1270, 1975 (Fair)	5300*
4010 diesel, 1962 (Fair)	3825	4430 diesel, 1975 (Good)	9900*	165 diesel, 1969 (Rough)	2400*	1370 diesel, 1976 (Fair)	6400
4020, 1967 (Fair)	3000*	4430 diesel, 1975 (Fair)	11,750*	240, 1985	7100*	1370, 1977 (Rough)	3500*
4020 diesel, 1966 (Fair)	5000*	4630, 1976 (Good)	11,000*	240, 1985	7100*	1470, (Rough)	4600*
4020 diesel, 1968 (Good)	5500*			1100, 1967 (Rough)	2400*	1690, (Good)	10,000*
4020 diesel, 1965 (Fair)	4600*	FERGUSON & MASSEY-FERGUSON		1100, 1967 (Rough)	1600*	MASSEY-HARRIS TRACTORS	
4020 diesel, 1966 (Good)	6200*	TE-20, 1944 (Rough)	975*	1105, 1978 (Good)	5500*	44, 1950 (Fair)	435*
4020, 1970 (Good)	6900*	TO-20	425	1135 diesel, 1976 (Fair)	5150	MINNEAPOLIS-MOLINE TRACTORS	
4020, 1966 (Fair)	3300*	TO-30, 1951 (Rough)	725	1805, 1975 (Good)	8500	U-302 LP, 1970 (Rough)	2100*
4020 diesel, 1967 (Good)	5900*	30, 1950 (Fair)	1050	CASE TRACTORS		G-1000, 1971 (Fair)	2200*
4020 diesel, 1966 (Fair)	4800*	35 diesel, 1955 (Fair)	1200	VC, 1947 (Good)	220	UB	500
4020 diesel, 1970 (Fair)	6300*	35 diesel, 1962 (Rough)	2100*				

NOTES:

Prices reported are for individual sales at wholesale on an "as is," "cash and carry" basis. Prices reported are not averages.

Condition Classifications:

EXCELLENT: Engine in perfect condition, 400 to 600 hours of use. Rubber—80% tread remaining, no breaks or cracks. Paint—original and bright. General appearance: excellent.

GOOD: Engine in good running condition. Rubber—70% tread remaining, no

breaks or cracks. Paint—original or a good repaint job. General appearance: good over-all.

FAIR: Engine possibly in need of a minor overhaul. Rubber—60% tread remaining, some cracking evident in sidewalls. Paint—only fair, weathered and some rust apparent. General appearance: worn, some dents, minor parts (gag covers, etc.) missing or broken.

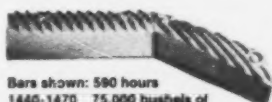
ROUGH: Engine obviously in need of a major overhaul. Rubber—smooth. Paint—scarred, weathered, rusty. General appearance: dents, ruptures, broken parts, loose wires, components (such as lights) broken, missing or inoperative.

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Owner: Marie Colyar—Endicott, WA

ON-TIME DELIVERY PRICE COMPETITIVE WITH GOOD MARGINS



Impeller shown: 350 hours
1440-1470 50,000 bushels of peas,
lentils, grass seed, wheat
and barley
Owner: Rich Baden—Spangle, WA

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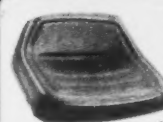
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- 16 3/4" wide - 1/2" deep - 6" high back



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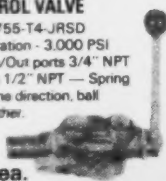
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Implement & Tractor

The business magazine of the farm and industrial equipment industry

MAY 1986

New Dealer Builds on Parts Marketing

page 26



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ANDREA SCHWARZ SRI
CONGRESS INFO SVC - STE 800
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BETHESDA MD 20814

Reconstruction, Part III:
What's Happened to Combines?
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Implement & Tractor

The business magazine of the farm and industrial equipment industry.

May 1986 • Vol. 101 • No. 7



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- 10: Where Have All the Combines Gone?** The bubble was big, and it burst with a bang, leaving sales of new combines in shambles. This third in an I&T series looks at how the combine builders are preparing for the future.
- 14: Where the Horsepower Went.** The annual report of tractor sales by horsepower and state.
- 16: Flatagri Combine Stars at Quiet Paris Show.** The world's largest ag machinery show was highlighted by a combine with a front-mounted rotary separator.
- 26: Building the Parts Business: Focus on Parts Marketing.** An aggressive system has won back parts sales to wholegoods customers, and helped New Madrid Tractor triple its total sales in a few short years.

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Retail Sales: Biz-as-Usual Returns

The February leap in retail sales of farm equipment, as reported by the Farm & Industrial Equipment Institute, was compensated for by a weak market performance in

March. But tractors under 40 horsepower, mostly Japanese imports, continued their upward path.

The big jump in February sales of tractors has been at-

tributed to one tractor company's program whereby dealers moved unretailed inventory into their own possession.

	Unit Retail Sales					
	March		Pct.	January-March		Pct.
	1986	1985	Change	1986	1985	Change
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	5,539	4,703	+17.8	11,167	9,352	+19.4
40-99 hp	2,002	3,298	-39.3	6,267	7,748	-19.1
100-139 hp	342	922	-62.9	1,368	2,160	-36.7
Over 140 hp	523	1,004	-47.9	2,433	2,689	-9.5
Total 2-wheel drive	8,406	9,927	-15.3	21,235	21,949	-3.3
4-wheel drive						
Under 200 hp	47	84	-44.0	165	215	-23.3
Over 200 hp	65	142	-54.2	349	362	-3.6
Total 4-wheel drive	112	226	-50.4	514	577	-10.9
Total All Tractors	8,518	10,153	-16.1	21,749	22,526	-3.4
S-P Combines	156	227	-31.3	1,013	1,140	-11.1
Balers (under 200-lb. bales)	275	469	-41.4	673	908	-25.9
Forage Harvesters (shear-bar type)	56	139	-59.7	178	309	-42.4
Mower-Conditioners	647	790	-18.1	1,302	1,462	-10.9

Ready for Plastic, Throw-Away Balers?

A Canadian plastics manufacturer says his firm, PPD Technologies, has designed a plastic baler that will make about 10,000 bales before wearing out.

Kaji Koda, vice-president of PPD, was quoted in Canada's Western Producer farm paper as saying that the technology and market are at hand for disposable farm machinery. "I don't know how many farmers

do 10,000 bales over three or four years. The product should retail for \$3,500 (about \$2,800 U.S.—Ed.). Frankly, for a part-time farmer, does he need more than 10,000 bales, can he afford any more than \$3,500 and does he care?"

Other plastic items anticipated by Koda: Wheel rims ("If it can take the weight and can take the transport, does it matter what it's made of?"); graphite shafts; cultivator shanks; non-lubricant bearings.

Briefly...

Massey-Ferguson Ltd. has announced it will spend \$31.5 million on its Coventry, U.K., tractor plant to improve production efficiency on its 200 series.

BAGMA, the British trade association of farm and garden equipment dealers, has named Bill Barrell as its new director general. He succeeds Jonathan Swift, who will manage a British hardware association.

Canada's March Sales: Same Pattern as U.S.

After a February spurt in Canadian retail sales of tractors, March activity was down substantially in most product categories, according to the Canadian Farm & Industrial Equipment Institute.

Tractor sales in March of 1,031 were down 21 per cent from a year earlier; for the year to date, they were still up 9 per cent at 3,603 units. Under-40-hp units went up in March, but all other tractor horsepower categories were down.

Nebraska Alters Its Tractor Test Law

Nebraska's legislature has revised the state's law concerning tractor testing. From now on, any tractor which has been tested according to codes of the OECD (Organization for Economic Cooperation and Development) can be marketed in that state without having to be tested again.

The Farm & Industrial Equipment Institute, which is the designated authority for implementing the OECD test program in the U.S., has told the Dept. of Commerce it intends to implement the testing of tractors in the U.S. according to OECD codes. Engineers from member companies are scheduled to meet with Nebraska Test engineers to discuss the feasibility of the Nebraska Tractor Test Lab running or overseeing the tests and issuing OECD reports, according to the FIEP's newsletter.

Inventory Watch

What's happening to stockpiles in relation to sales.

Equipment	Inventory Levels							12-Month Sales, Mar. '85-Feb. '86
	Feb. 28 1985	Sept. 30 1985	Oct. 31 1985	Nov. 30 1985	Dec. 31 1985	Jan. 31 1986	Feb. 28 1986	
Tractors:								
Under 40 hp	43,356	40,319	41,153	44,086	46,559	51,537	56,446	58,193
40-99 hp	32,984	27,686	26,455	26,464	25,658	25,480	25,929	37,662
Over 100 hp	28,471	23,487	23,171	22,861	22,243	21,204	20,918	16,713
Four-wheel drive	4,778	3,811	3,601	2,889	2,889	2,719	2,623	2,963
Total Tractors	109,589	95,303	94,380	96,811	97,349	100,940	105,916	115,531
S-P Combines	9,002	8,969	8,353	7,249	6,685	6,373	6,342	8,355

Source: Farm & Industrial Equipment Institute

RETAIL SALES OF SELECTED FARM EQUIPMENT — Jan.-Dec., 1984 and 1985(1) (In Units)

State	Combines Self-Propelled		Corn Heads		Hay Bales(2)		Windrowers Self-Propelled				Grinder- Mixers		Shear-Bar Forage Harvesters(3)		Mower Conditioners All Types	
	1984	1985	1984	1985	1984	1985	Power Units		Total Heads		1984	1985	1984	1985	1984	1985
							1984	1985	1984	1985						
Alabama	89	59	23	24	101	86	.....	.....	.....	.....	41	41	12	11	91	88
Alaska	.....	.....	.....	.....	3	7	.....	.....	.....	.....	.....	.....	1	.....	3	5
Arizona	45	26	1	1	33	27	46	50	56	55	1	1	9	4	4	5
Arkansas	424	181	8	5	165	168	.....	.....	.....	.....	31	28	11	2	250	216
California	78	62	38	22	131	99	159	178	180	204	1	1	37	45	22	30
Colorado	121	109	47	34	258	229	112	103	123	120	12	12	23	21	85	110
Connecticut	.....	.....	.....	.....	37	26	.....	.....	.....	.....	1	1	31	19	60	48
Delaware	33	28	22	22	13	12	.....	1	.....	1	3	8	7	1	11	12
Florida	20	16	5	5	72	78	.....	1	-2	2	3	5	16	17	38	54
Georgia	238	149	111	78	133	136	1	.....	1	.....	44	39	31	27	150	125
Hawaii	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Idaho	183	112	3	3	220	200	136	108	148	139	13	3	27	14	55	60
Illinois	1,424	1,086	1,297	1,062	236	143	4	3	6	3	140	129	103	49	417	325
Indiana	763	613	695	650	192	166	4	2	4	2	119	113	86	45	403	350
Iowa	982	635	1,115	640	171	80	22	15	23	16	288	180	105	46	517	252
Kansas	697	595	88	84	171	124	115	124	123	140	49	34	43	36	323	263
Kentucky	171	109	95	89	205	201	2	.....	2	.....	80	78	77	47	593	616
Louisiana	156	71	4	12	76	90	.....	.....	.....	.....	6	7	2	6	28	38
Maine	1	.....	.....	.....	53	53	2	2	2	2	.....	.....	20	28	86	71
Maryland	96	90	82	82	75	83	5	6	6	6	19	22	36	34	104	129
Massachusetts	.....	.....	.....	.....	37	27	.....	.....	.....	.....	.....	.....	24	28	58	68
Michigan	212	127	213	133	248	187	25	24	28	22	110	87	198	132	465	329
Minnesota	755	417	489	268	413	214	162	95	178	101	155	97	300	159	653	387
Mississippi	206	93	5	1	66	47	1	.....	1	.....	18	19	24	16	50	35
Missouri	444	397	141	157	298	255	22	11	16	12	118	71	44	29	879	628
Montana	191	120	.....	1	105	88	105	88	121	115	32	17	30	24	102	63
Nebraska	531	489	405	372	71	42	109	45	130	61	84	59	84	37	235	131
Nevada	1	1	.....	.....	28	26	26	31	30	37	2	2	2	10	8	14
New Hampshire	.....	.....	.....	.....	42	40	.....	.....	.....	.....	.....	1	20	15	57	57
New Jersey	11	6	4	8	29	32	1	.....	1	.....	9	3	6	4	50	43
New Mexico	11	23	1	2	151	124	38	50	40	52	2	2	3	6	24	35
New York	49	35	55	51	432	391	25	24	25	25	31	35	390	291	741	659
North Carolina	247	127	218	117	221	155	1	.....	1	.....	43	26	50	56	351	264
North Dakota	652	459	44	31	18	9	252	182	283	198	59	51	49	36	112	79
Ohio	466	438	391	369	340	307	11	11	11	11	145	118	131	100	613	646
Oklahoma	269	235	2	21	275	330	53	69	56	82	29	31	9	10	350	450
Oregon	77	85	8	8	167	159	65	94	74	115	2	6	28	21	78	95
Pennsylvania	112	95	107	101	539	468	31	26	31	26	132	147	266	206	842	717
Rhode Island	.....	.....	.....	.....	2	4	.....	.....	.....	.....	.....	.....	.....	.....	3	2
South Carolina	98	48	42	53	64	45	.....	1	.....	1	17	15	17	12	102	78
South Dakota	294	283	117	106	56	24	201	98	225	118	92	72	123	59	113	44
Tennessee	219	114	38	28	237	198	2	.....	2	.....	88	93	48	41	558	482
Texas	497	466	123	112	519	756	45	55	46	63	105	81	24	30	844	1,142
Utah	24	18	2	3	206	137	57	47	63	52	7	4	38	26	154	95
Vermont	.....	.....	2	.....	55	58	4	6	4	7	1	.....	61	53	165	137
Virginia	92	72	68	51	167	141	2	1	2	1	47	39	105	69	545	485
Washington	157	141	16	12	210	167	53	61	64	57	1	-1	28	40	110	95
West Virginia	2	.....	3	.....	84	68	.....	.....	.....	.....	15	10	12	17	121	114
Wisconsin	259	161	283	198	787	461	133	66	132	71	150	117	737	474	1,400	1,018
Wyoming	25	20	8	.....	102	65	59	35	71	43	4	10	10	5	34	30
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous(4)	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	2	.....	24
TOTAL	11,422	8,411	8,419	5,016	8,314	7,038	2,091	1,713	2,307	1,961	2,349	1,914	3,538	2,460	13,057	11,243

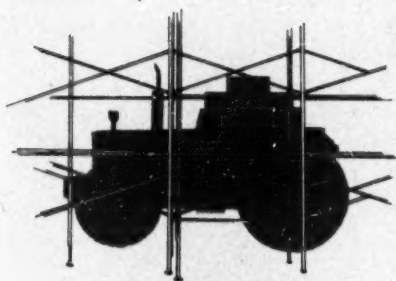
Data released Feb. 4, 1986, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.

(2) For making bales of under 200 lbs.

(3) Pull-type, mounted, self-propelled.

(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.



Reconstructing the Industry

The bubble was big, and it burst with a bang, leaving the sales of new combines in shambles. Yet crops are still being grown, and must be harvested. This third in an I&T series looks at how the combine builders are preparing for the future.

Part 3:

Where Have All the Combines Gone?

By Scott Nesbitt

■THE COMBINE business will never be the same, thanks to the six-year nose dive in sales and changes forced by the harsh realities of farm economics.

- Factories will get directly involved in sales to customers. Dealers will

either become combine specialists or get out of the business.

- The emphasis will shift from selling new combines to providing harvesting equipment—meaning the factories will get into the used sales business.

- The era of “me too” machinery will fade, as manufacturers slide into niches created by new technologies adopted by farmers who change their operations to survive. The companies that can will tap their world-wide resources to bring in new technology at cut-rate prices.

- Dealers who want to park a few combines on the front lot in late summer, just in case a customer walks in, might consider a new line of work. The manufacturers won't again get trapped by dead inventory, and changes in factories mean they won't have to.

These changes are a response to the crash of new combine sales—from 32,246 in 1979 down to a mere 8,402 in 1985 on the U.S. market. Canadian sales also slowed, though not as badly.

To get a handle on how the combine builders are restructuring to face the changed market, I&T talked to executives from each of the companies to prepare this report. We found a bit of the possible future in Wichita, Kan.

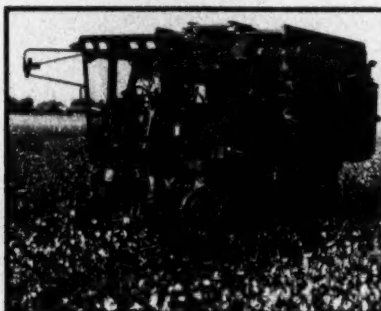
Used combine supermarket

When Massey-Ferguson spun off the Massey Combines Corp., retain-

A Gallery of Changes



Introduced in early 1985 as the White model 9320, this Class 5 combine is now the Massey Combines Corp. model 8560.



Many pieces from tractors, planters and combines were used to create Case-IH's model 1822 two-row cotton picker.



Beside the new Deutz-Allis name, the Gleaner rotary combines get a new straw spreader to meet farmers' needs, and a new P series designation.



Bucking an old tradition, the new Deere 4425 combine comes in from Germany.



Since New Combines Aren't Selling...

Massey Combine Corp. opened a used combine center in Wichita, Kan. Literature on the rack describes each machine, and the remodeled showroom has a lounge for browsers. Salesmen wait for customers to ask for help. The stock includes newer machines and old goodies like the M-F 410, last built in 1972. Each combine includes an 87-point inspection report and list of repairs done and those needed; many are given a warranty. If the pilot project works, the concept will be expanded to other states.



ing only 40 per cent ownership, the big question was, "If they lost money as part of Massey, how the heck are they going to make money out on their own?"

Part of the answer lies on the southwest side of Wichita, Kan., where the company-owned MF dealership has become what's called the world's first used combine center.

More than three dozen used MF combines and a handful of Allis-Chalmers Gleaners are arrayed outside. The machines range from as-is clunkers to mint-condition restorations. Inside each cab is an 87-point appraisal sheet and repair record.

Inside the dealership is a rack of

color-coded sheets describing each combine. Ownership history, usage, special features, repairs done and repairs needed are all listed, along with warranty and price. If a prospect wants to talk turkey, he has to catch a salesman.

"This was a pilot project," said Tony Colvin, special projects director for MCC. "If farmers thought it was stupid, we'd have gone on to something else. But the weekend we opened, 500 people showed up, and they loved it.

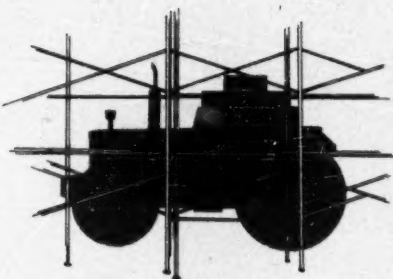
"It's a self-service supermarket concept," Colvin continued. "It's how real estate is sold, except we don't put a picture of the combine on the sheet.

"We'll be extending the concept, with a booklet for dealers and a used combine locator service. If a farmer wants something specific, we'll find it for him and get it down here if he's serious.

"We project three or four of these combine centers in each state in the grain belt. We have other projects that we'll be unfolding over a five-year period. The whole strategy is based on making it easy for customers to do business with us. It's the way things have got to go."

Dick Brown, MCC's vice-president, said used combine sales are a precursor to new sales. In normal times there are two used sales to one

(More...)



The Combine Business

(continued)

new, but recently it's been a four-to-one ratio. Until normalcy returns, if ever, the company must pay atten-

tion to used machines.

"The distribution channels must change," Brown said. "We're aggressively going to the customer. Take for example Caterpillar, where a good percentage of their business is on a bid basis with company involvement. We can't leave marketing to the traditional approach.

"The whole industry is undergoing a key structural change. We'll not limit ourselves to the Massey-Ferguson dealer network. Some green dealers are selling our rotary because they didn't have one and there's a certain demand for that product.

"The old rules have to change,

and the market must rebound, simply because of replacement. The average age of a combine is 9.8 years in the U.S. and 8.2 years in Canada; those machines have to wear out. The new market should get back to a level of 21,000, but new sales depend on so many factors, it's hard to predict the year."

Disrupted factories

The rotary combines MCC is offering to the green dealers, and others, started life as a White machine, but went to Massey during White's bankruptcy (U.S.) and receivership (Canada) travails last year.

Bob Terry, president of the revived White Farm Equipment within the expanding Allied Products Corp. group, was dealt out of the combine market, but he sees sales coming back to 20,000 units annually, and wants back in.

"The combine is still a market that's worth being in," said Terry, who projects a rebound in 1988 or 1989. "Right now, a combine is replaced because the farmer damages it, makes it eat rocks or severely damages the straw walkers."

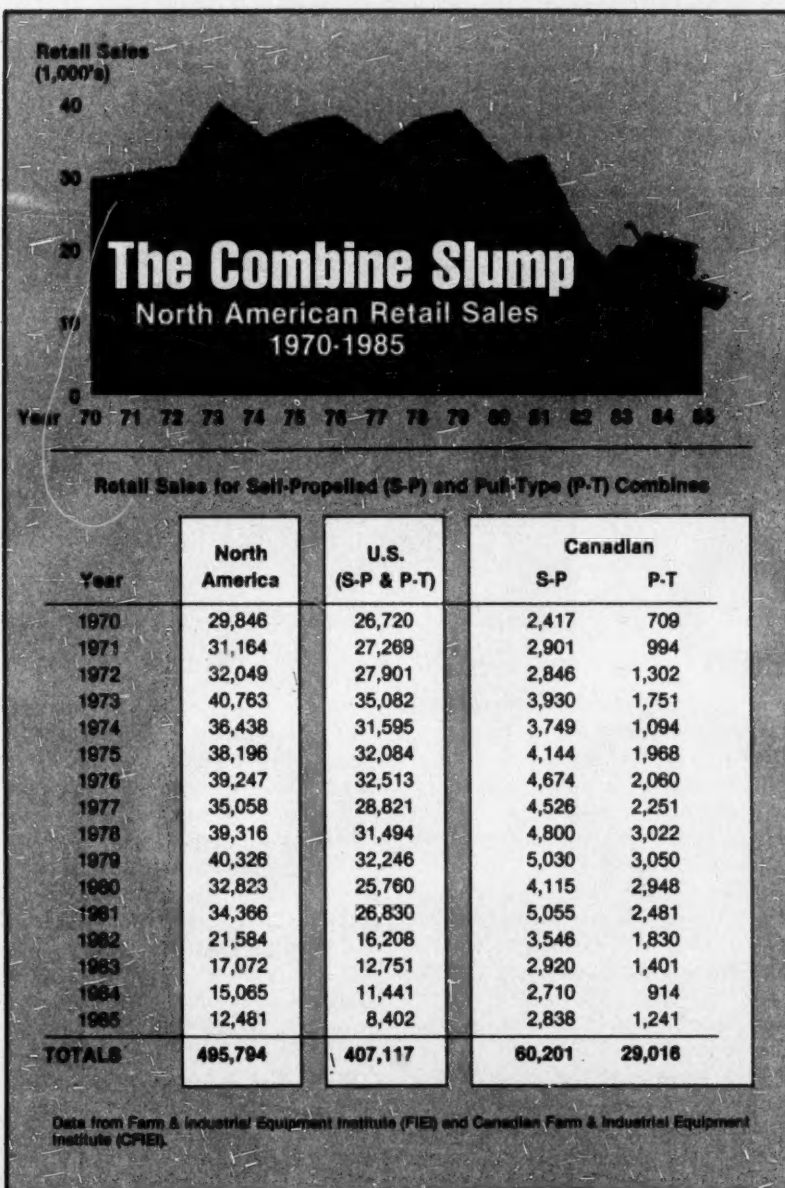
Terry said White has discussed with Massey the private-label production of the former White 9320 and 9720 axials, but there's no deal yet. He also said White is testing four combines from another manufacturer, for possible introduction in 1987.

"We're concerned with cost, a product that lets us and the dealer make a profit at a competitive price. Beside cost, there's reliability, a product that's going to last. The grain loss monitors, electronics and such, are not what makes a guy buy," Terry said.

White is looking for a combine line, Terry said, because the company is serious about being a full-line manufacturer.

"Luckily we don't have to rush right now," he said. "There's a glut of used equipment, and banks and crop prices will have to get more favorable before sales pick up. We're finding out that combines can last a very long time, because they really were built pretty well. We may yet learn just how long they will last."

The disruptions in the White and Massey organizations have left a



consolidated manufacturing/engineering operation at Brantford, Ontario, where both companies had factories. MCC has moved its Toronto-area operations down to Brantford, mixing combine production in with balers, implements and related components.

Comparable moves of manufacturing sites have become the rule in the industry.

New Holland closed its Lexington, Neb., combine plant, moving operations to Grand Island, Neb.

After buying International Harvester's ag operations, J I Case closed the IH cotton picker plant at Memphis, Tenn., and moved production to the combine plant at East Moline, Ill., where corn heads, planters and cabs for combines and tractors are also made.

After Allis-Chalmers ag was bought by Deutz, the Gleaner plant at Independence, Mo., absorbed operations from a machining center in nearby North Kansas City, Mo., while retaining a Topeka, Kan.,

production center for headers.

Only John Deere hasn't heavily re-arranged its combine manufacturing, but has taken some extended plant layoffs along with others in the business.

"With the industry the way it's been, you fill the plants that do the job, and shut the others down," said Jerry Salzman, manager of combine promotion for Case-IH.

"The secret is to keep 'spikes' out of the production scheduling, avoid the layoffs and startups, then sell everything we build. We're interested in turnover of the product, but it's not easy for any of us in the combine business. It helps to put the combines in with other products, and have something else to build in the plant to keep things flowing smoothly."

Engineering the future

Case-IH recently introduced a new 1600 series of axial combines, and most recently unveiled a new model 1822 two-row cotton picker that demonstrates a growing

trend—parts commonality among compatible lines of equipment.

"We used to have different grain and corn combines," said Salzman. "They had different transmissions. Now they share a lot of parts, and it's relatively easy to switch production between the two types, to respond to demand."

The model 1600 combine cab, transmission and final drives are also used for the Case-IH cotton pickers, which use the same guide axles and fuel tanks as the agricultural tractor line.

Pressurized misting tanks on the cotton pickers are the same as the liquid fertilizer tanks on the Early Riser Cyclo Air planters.

The Deutz-Allis Gleaners share many components between the conventional and rotary series.

When Massey absorbed the White axials, it got a bonus: Brown said the same engineer worked on both lines, resulting in a 30 per cent commonality, particularly in drivelines, hydraulics and other powered com-

(Continued on page 24)



IRRIGATION/AGRICULTURAL ENGINE and PUMP MONITORS and PROTECTION NEVER MORE CRITICAL ...!

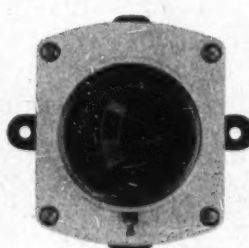
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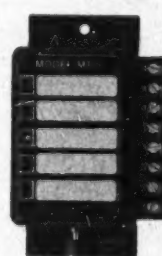
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1985 Retail Sales of Farm Wheel

Two-Wheel Drive Tractors											
State	Under 20	20- 29	30- 39	40- 49	50- 59	60- 69	70- 79	80- 89	90- 99	100- 119	120- 129
Alabama	699	547	353	420	248	146	147	106	7	38	46
Alaska	16	19	.....	.....	1	.....	.....	2	1	.....	.....
Arizona	201	537	56	61	16	24	64	38	9	26	19
Arkansas	889	736	313	496	262	303	101	64	3	25	15
California	1,151	1,194	246	232	309	340	713	263	38	131	55
Colorado	229	190	83	53	63	54	28	36	5	33	34
Connecticut	269	213	93	40	30	34	1	12	2	1	2
Delaware	93	70	18	12	13	9	.....	13	4	13	6
Florida	1,236	918	453	464	254	289	382	336	5	55	36
Georgia	1,030	965	726	824	381	290	279	278	6	49	99
Hawaii	33	36	24	4	9	5	9	4	.....	.....	.....
Idaho	86	85	20	32	45	41	50	44	9	48	41
Illinois	731	368	97	143	228	174	165	169	12	113	81
Indiana	789	444	109	189	122	148	109	126	11	72	52
Iowa	196	139	32	76	48	106	189	115	34	116	122
Kansas	305	218	62	77	72	60	45	72	26	88	95
Kentucky	553	374	285	557	432	281	202	178	12	42	17
Louisiana	980	938	277	393	139	181	129	43	2	47	22
Maine	244	187	54	37	37	28	11	11	1	5	3
Maryland	856	479	157	176	126	83	58	66	6	39	28
Massachusetts	259	245	106	62	49	26	14	12	2	4	2
Michigan	950	539	172	181	232	208	168	133	14	77	47
Minnesota	202	106	47	50	57	105	96	141	24	164	118
Mississippi	488	581	286	400	207	240	192	171	2	19	25
Missouri	898	526	153	310	242	186	185	161	16	83	49
Montana	75	73	50	60	24	66	20	46	11	36	37
Nebraska	68	55	25	22	22	32	16	56	8	64	89
Nevada	34	26	5	2	11	6	6	9	.....	5	.....
New Hampshire	318	343	101	53	63	30	13	12	4	4	2
New Jersey	343	369	111	85	63	26	25	13	2	9	5
New Mexico	75	93	72	46	21	35	51	22	1	10	13
New York	1,100	783	254	257	310	228	209	262	21	102	55
North Carolina	1,164	829	583	824	289	226	151	165	8	39	36
North Dakota	69	54	14	11	18	24	10	36	12	91	85
Ohio	1,597	726	241	270	298	263	268	219	26	94	68
Oklahoma	548	417	129	191	111	102	111	108	5	74	58
Oregon	585	264	91	146	130	106	73	66	5	30	21
Pennsylvania	1,742	747	204	262	216	242	196	209	17	106	56
Rhode Island	37	31	7	9	6	4	1	1	.....	.....	.....
South Carolina	506	523	300	315	139	113	87	99	2	9	17
South Dakota	25	25	11	10	16	37	23	55	24	83	52
Tennessee	1,073	735	476	909	392	342	149	131	5	44	21
Texas	2,791	2,843	992	1,538	688	1,067	619	605	70	243	185
Utah	123	109	47	56	56	34	48	23	18	24	25
Vermont	156	122	29	37	40	41	66	48	10	15	8
Virginia	929	600	337	451	272	199	132	159	16	45	32
Washington	407	303	114	228	251	84	66	47	9	21	13
West Virginia	212	103	67	116	76	46	38	14	.....	8	3
Wisconsin	244	184	49	94	135	263	239	431	59	231	174
Wyoming	30	16	7	4	10	11	13	23	4	17	7
U.S. Government	.....	1	.....	.....	1	11	.....	.....	.....	.....	.....
Miscellaneous	6	48	.....	51	36	9	141	15	.....	.....	.....
TOTAL	27,620	21,076	8,518	11,336	7,316	7,008	6,131	5,468	588	2,692	2,075

DATA: Farm & Industrial Equipment Institute. Figures do not include garden tractors, motor tillers, or contractor's off-highway types. Report includes units marketed by these firms: Case International, Deere, Deutz, Deutz-Allis, Ford, Hesston, Kubota, Long, M-R-S, Massey-Ferguson, SAME, Steiger, Versatile, White, and Yanmar. Sales reported as

Tractors by PTO Horsepower (In units)

				Four-Wheel Drive Tractors				Total All Farm Wheel Tractors	State
130-139	140-159	160-179	180 & Over	Total 2-Wheel Drive	Under 200	200-249	250 & Over		
29	40	32	14	2,872	1	.....	1	2	2,874 Alabama
.....	.....	.....	.....	39	.....	.....	.....	.....	39 Alaska
31	44	80	35	1,240	1	6	22	29	1,269 Arizona
28	48	135	265	3,683	8	23	39	70	3,753 Arkansas
68	68	70	53	4,931	14	33	27	74	5,005 California
29	47	52	47	983	26	21	42	89	1,072 Colorado
.....	4	.....	2	715	1	.....	.....	1	716 Connecticut
6	4	9	5	286	4	3	.....	7	293 Delaware
15	62	22	16	4,543	17	10	3	30	4,573 Florida
28	165	73	49	5,242	3	1	1	5	5,247 Georgia
.....	.....	1	1	126	4	.....	5	9	135 Hawaii
35	58	88	104	786	39	19	25	83	869 Idaho
200	255	361	230	3,327	123	73	56	252	3,579 Illinois
114	168	201	135	2,789	47	31	35	113	2,902 Indiana
212	197	219	93	1,894	38	20	10	68	1,962 Iowa
106	191	184	138	1,739	79	100	69	248	1,987 Kansas
32	26	28	45	3,044	9	7	7	23	3,067 Kentucky
8	25	88	147	3,419	6	13	47	66	3,485 Louisiana
3	3	1	.....	625	.....	.....	.....	.....	625 Maine
19	23	12	11	2,139	.....	2	1	3	2,142 Maryland
.....	1	1	.....	783	.....	.....	.....	.....	783 Massachusetts
48	105	70	31	2,975	34	25	15	74	3,049 Michigan
177	192	159	76	1,714	75	68	59	202	1,916 Minnesota
33	42	212	274	3,172	3	.....	17	20	3,192 Mississippi
92	86	97	75	3,159	13	7	15	35	3,194 Missouri
31	30	25	18	602	43	40	39	122	724 Montana
112	126	162	106	963	41	13	9	63	1,026 Nebraska
4	2	1	2	113	2	2	.....	4	117 Nevada
.....	3	.....	.....	946	.....	.....	.....	.....	946 New Hampshire
2	4	3	2	1,062	1	.....	.....	1	1,063 New Jersey
11	33	18	28	529	7	5	6	18	547 New Mexico
59	53	19	5	3,717	16	1	4	21	3,738 New York
33	61	35	35	4,478	4	.....	5	9	4,487 North Carolina
123	156	149	65	917	126	129	96	351	1,268 North Dakota
113	171	119	64	4,537	28	20	8	56	4,593 Ohio
45	158	100	46	2,203	50	69	48	167	2,370 Oklahoma
17	34	36	22	1,606	14	14	8	36	1,642 Oregon
38	31	19	10	4,095	6	5	5	16	4,111 Pennsylvania
1	.....	.....	.....	97	.....	.....	.....	.....	97 Rhode Island
9	18	9	25	2,171	2	2	1	5	2,176 South Carolina
156	108	141	43	809	79	31	48	158	967 South Dakota
48	59	80	58	4,522	2	4	10	16	4,538 Tennessee
184	477	522	428	13,252	40	65	87	192	13,444 Texas
15	23	18	6	625	.....	1	5	6	631 Utah
10	15	2	1	600	2	.....	.....	2	602 Vermont
24	33	19	5	3,253	2	2	1	5	3,258 Virginia
28	36	24	21	1,652	17	26	40	83	1,735 Washington
.....	2	.....	.....	685	.....	.....	.....	.....	685 West Virginia
152	193	125	42	2,615	44	8	8	60	2,675 Wisconsin
5	14	6	1	168	16	2	.....	18	186 Wyoming
.....	.....	.....	.....	13	.....	.....	.....	.....	13 U.S. Government
.....	.....	.....	.....	306	.....	.....	.....	.....	306 Miscellaneous
2,533	3,694	3,827	2,879	112,761	1,087	901	924	2,912	115,673 TOTAL

Miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Auction Prices

Asterisk beside price indicates highest bid offered on tractors that were not sold.

YODER & FREY, INC. Archbold, Ohio March 11, 1986

INTERNATIONAL HARVESTER TRACTORS

A, 1949 (Fair).....	985
A, 1950 (Fair).....	800*
A, ...	580
Cub Lo-Boy, 1966 (Good).....	1775*
H, 1950 (Fair).....	400
H, 1949 (Fair).....	450
H, 1950 (Fair).....	550
H, 1950 (Fair).....	750
H, 1941 (Fair).....	675
M, 1950 (Fair).....	650*
M, 1951 (Fair).....	550
M, 1948.....	800*
M, 1952 (Good).....	650
Sup. M, 1954 (Fair).....	725
Sup. M, 1952 (Good).....	700*
2400-A, (Good).....	2400*
C, 1949 (Fair).....	1000*
100, cult., 1957 (Fair).....	1900*
100, cult., 1955 (Rough).....	1475*
300, 1956 (Rough).....	650
350, 1956 (Rough).....	2050*
400, 1956 (Fair).....	900*
460, 1960 (Fair).....	1600
460 diesel, 1960 (Fair).....	1350*
460, 1961 (Rough).....	1350*
460 diesel, 1958 (Rough).....	825*
504 diesel, 1966 (Rough).....	2600*
504, 1967 (Fair).....	1900
504, 1968 (Rough).....	1500

560, 1961 (Rough).....	700
560 diesel, 1959 (Rough).....	1400*
560, 1960 (Good).....	2250
574, 1975 (Fair).....	3400*
624, 1965 (Fair).....	1650
656, 1967 (Fair).....	3100*
666 diesel, 1973 (Good).....	4900*
666, 1975 (Fair).....	4900*
674, 1974 (Good).....	6500
686, 1977 (Fair).....	6500*
706, 1965 (Rough).....	1400*
706, (Good).....	3100
706, 1963 (Fair).....	1750*
756, 1969 (Good).....	3900
756, 1970 (Rough).....	2250
756, 1970 (Fair).....	2975
766 diesel, 1972 (Fair).....	4250*
806, 1964 (Fair).....	2600*
806 diesel, 1965 (Fair).....	4000*
806, 1964 (Fair).....	2750*
806 diesel, 1964 (Fair).....	2600*
806 diesel, 1965 (Rough).....	2200
806 diesel, 1963 (Fair).....	2600*
806 diesel, 1965 (Good).....	3100*
806, 1966 (Rough).....	1800
806, 1965 (Rough).....	2250*
826 diesel, 1970 (Good).....	4000*
826 diesel, 1970 (Good).....	4100*
856 diesel, 1967 (Fair).....	4150
856, 1970 (Fair).....	4850
856, 1969 (Fair).....	4300
856 diesel, 1970 (Fair).....	4450
856 diesel, 1967 (Fair).....	4200*
856 diesel, 1970 (Fair).....	4100*
966, 1976 (Good).....	9100*
966 diesel, 1974 (Fair).....	4600*

966, 1974 (Fair).....	4800*
966, 1973 (Good).....	6800*
966 diesel, 1974 (Good).....	6250
966 diesel, 1978 (Good).....	9000*
966, 1981 (Excellent).....	11,500*
966, 1976 (Fair).....	7300*
966, 1977 (Fair).....	8100*
1066 diesel, 1972 (Good).....	6400*
1066 diesel, 1974 (Good).....	6500
1066 diesel, 1974 (Good).....	6600
1066 diesel, 1975 (Fair).....	5100*
1066 diesel, 1974 (Good).....	6600*
1066, 1972 (Fair).....	5750*
1066 diesel, 1977 (Good).....	12,500*
1066 diesel, 1979.....	11,100
1066 diesel, 1976 (Fair).....	9300*
1206 diesel, 1967 (Rough).....	3700*
1206, 1964 (Fair).....	3600*
1206, 1965 (Fair).....	2900*
1206, 1966 (Fair).....	3700*
1206, 1966 (Fair).....	3350
1256, 1968 (Fair).....	4500*
1256 diesel, 1970 (Fair).....	4800*
1456 diesel.....	6000
1466, 1974 (Fair).....	6250*
1466 diesel, 1973 (Good).....	5800*
1466 diesel, 1974 (Good).....	5800*
1466, 1974 (Fair).....	6000
1466 diesel, 1974 (Good).....	6000*
1466, 1974 (Fair).....	5250*
1466, 1973 (Fair).....	6100*
1466 diesel, 1973 (Rough).....	4100*
1566 diesel, 1974 (Good).....	7100
1566.....	8000
1566, 1979 (Good).....	9500*
1566, 1978 (Fair).....	6750*

1566, 1961 (Good).....	10,250*
1566 diesel, 1978 (Good).....	9400*
3566, 1979 (Good).....	11,750*

DEUTZ TRACTORS

DX160 diesel, (Good).....	15,000
D6006 diesel, (Fair).....	4600*
D5006 diesel, (Fair).....	3500*
D13006 diesel, 4WD, (Fair).....	7000*

STEIGER TRACTOR

Wildcat, 1977 (Fair).....	8200*
---------------------------	-------

JOHN DEERE TRACTORS

730, 1959 (Rough).....	1700*
730 diesel, 1958 (Fair).....	1850
50, 1955 (Fair).....	1150
70 diesel, 1955 (Fair).....	900*
70 diesel, 1954 (Good).....	1050*
60, 1954 (Fair).....	900*
60, ldr., 1955 (Fair).....	1100*
60, ldr., 1954 (Fair).....	1275
60, 1964 (Fair).....	800*
60, 1955 (Rough).....	625
60, 1957 (Fair).....	850
530, 1958 (Fair).....	1500*
430, ldr., 1960 (Rough).....	1900
630, 1958 (Fair).....	1150*
720 diesel, 1956 (Fair).....	1900
830 diesel, 1959 (Rough).....	2500
2010, 1971 (Good).....	3000
2030 diesel, ldr., 1974 (Good).....	5300*
2350 diesel, (New).....	10,950
2440 diesel, 1978 (Rough).....	5750*

(More...)

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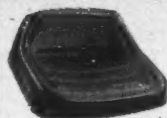


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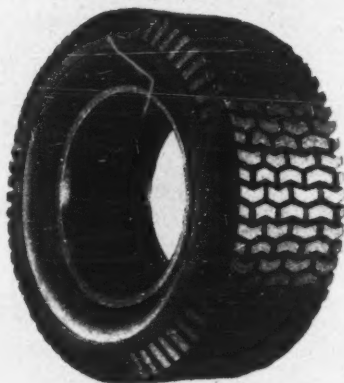
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Telex: 13834 Kemgold

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Auctions (continued)

3010 diesel, 1962 (Fair)	2800*
3010 diesel, 1962 (Fair)	2950
3010 diesel, 1961 (Good)	2950*
3020 diesel, 1969 (Fair)	3000
3020 diesel, 1968 (Good)	4850
4010 diesel, 1962 (Fair)	3500*
4020 diesel, 1966 (Fair)	4850*
4020 diesel, 1969 (Rough)	4500*
4020 diesel, 1963 (Rough)	4350
4020 diesel, 1972 (Good)	6200*
4020, 1966 (Rough)	2600
4020 diesel, 1969 (Good)	5950
4020 diesel, 1972 (Good)	6750*
4020 diesel, 1967 (Good)	5450
4020 diesel, 1972 (Fair)	5850*
4020 diesel, 1966 (Fair)	5000
4030 diesel, 1974 (Good)	5800*
4040 diesel, 1980 (Good)	11,800
4230 diesel, 1975 (Fair)	9250*
4230 diesel, 1974 (Good)	8750*
4230 diesel, 1976 (Fair)	7900*
4230 diesel, 1972 (Fair)	6000*
4320 diesel, 1973 (Good)	6500*
4320 diesel, 1976 (Good)	8900
4430 diesel, 1977 (Fair)	9100*
4430 diesel, 4WD, 1975 (Rough)	10,500*
4430 diesel, 1975 (Good)	10,000
4430 diesel, 1976 (Good)	9500*
4430 diesel, 1977 (Good)	8500*
4620 diesel, 1972 (Fair)	4200*
4630 diesel, 1977 (Fair)	10,500*
4630 diesel, 1978 (Good)	10,100*

CASE TRACTORS

430, 1966 (Rough)	1500
580 diesel, 1970 (Fair)	4100*
930 diesel, 1966 (Rough)	3200*
930 diesel, 1966 (Fair)	1700
930 diesel, 1965 (Fair)	1900
970 diesel, ldr., 1974 (Rough)	6500*
1070 diesel, 1965 (Fair)	3000
1070 diesel, 1975 (Fair)	5800
990 diesel, 1960 (Fair)	1950
1200 diesel, 1968 (Fair)	2900
2290 diesel, 1980 (Fair)	10,000*

WHITE TRACTORS

2-75 diesel, 4WD 1984 (Good)	14,050
2-150 diesel, 1976 (Excellent)	8200*
2-150 diesel, 1977 (Good)	7650*

MINNEAPOLIS-MOLINE TRACTORS

U-302 LP, 1966 (Fair)	2100*
M-670, 1968 (Fair)	1650

FORD TRACTORS

Jub., ldr., 1954 (Rough)	2200*
Jub., 1954 (Rough)	1775
8N, 1945 (Rough)	1025*
8N, 1947 (Rough)	825
8N, 1952 (Good)	1400*
8N, 1951 (Rough)	1050*
8N, 1952 (Fair)	1400
9N, 1943 (Rough)	825
9N, 1944 (Fair)	875*
9N, 1945 (Rough)	775
800, 1957 (Good)	1900
860, 1958 (Good)	2400*
901 diesel, 1958 (Good)	2100*
861, 1958 (Rough)	2475
4000 diesel, ldr., 1971 (Fair)	5000
4000 diesel, ldr., 1972 (Rough)	1500
4000 diesel, ldr., 1972 (Rough)	1550
5000, 1965 (Fair)	4500*
5000 diesel, 1972 (Good)	4500*
7000 diesel, 1974 (Fair)	5000*
8600 diesel, 1974 (Rough)	5800*
9600 diesel, 1975 (Rough)	4100*
9600 diesel, 1974 (Fair)	6500
9700 diesel, 4WD, (Rough)	10,000
8600 diesel, ldr., 1976 (Good)	6400
8700 diesel, 1979 (Good)	8900

OLIVER TRACTORS

88 diesel, 1955 (Rough)	850*
1255 diesel, ldr., (Fair)	4050*
1600, 1961 (Fair)	2000
1850 diesel, 1965 (Fair)	2550

1650 diesel, 1967 (Rough)	1700
1650 diesel, ldr., 1966 (Fair)	4900
1650, 1965 (Rough)	1700*
1655 diesel, 1973 (Fair)	2900*
1800 diesel, 1964 (Rough)	1825
1800 diesel, 1962 (Fair)	2450
1800, 1962 (Fair)	1800
1850 diesel, 1965 (Fair)	4200
1850 diesel, 1967 (Rough)	1600*
1850 diesel, 1965 (Good)	2850*
1850 diesel, 1966 (Fair)	2400
1855 diesel, 1973 (Fair)	4000*
1855 diesel, 1972 (Fair)	4600*
1855 diesel, 1972 (Fair)	2400*
2255 diesel, 1973 (Good)	6700*

FERGUSON & MASSEY-FERGUSON

TO-20, 1954 (Fair)	1025*
TO-20, 1942 (Rough)	900*
MH-40, 1959 (Fair)	1800*
35 diesel, 1980 (Fair)	1950
35 ldr., 1954 (Fair)	2000*
35, 1959 (Fair)	1700*
35, 1961 (Fair)	1800*
85, 1967 (Fair)	1200
90, 1961 (Fair)	1300
135, 1970 (Good)	3200
165 diesel, 1967 (Fair)	2800*
165, 1969 (Rough)	2550
240 diesel, (New)	6900*
255 diesel, 1980 (Good)	5250
265 diesel, 1975 (Fair)	5150*
285 diesel, 1979 (Fair)	5000*
285 diesel, 1977 (Fair)	6250*
1100 diesel, 1970 (Rough)	2400*
1100, 1969 (Rough)	1650
1130 diesel, 1969 (Rough)	2900*
1155 diesel, (Rough)	2800*
1805 diesel, 1974 (Good)	6125
2775 diesel, 1978 (Fair)	8400

ALLIS-CHALMERS TRACTORS

C, 1951 (Rough)	1025*
D-15, 1966 (Fair)	1825
D-17, plow, 1963 (Fair)	1600*
D-17 diesel, plow, 1961 (Fair)	2050*
D-19, 1966 (Good)	2000*
190XT diesel, 1967 (Fair)	3600*
190XT diesel, 1967 (Rough)	1450
200 diesel, 1972 (Fair)	4375*
200 diesel, 1971 (Fair)	4900
6060 diesel, (New)	15,500*
7000 diesel, 1977 (Fair)	5750*
7060 diesel, 1975 (Good)	6100*
7080 diesel, 1976 (Fair)	7000*

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1986

ALLIS-CHALMERS TRACTORS

5020, ldr., (Good)	3050
180 diesel, 1969 (Fair)	2950

DAVID BROWN TRACTOR

1995, 1970 (Good)	2000
-------------------	------

CASE TRACTORS

1212, 1969 (Fair)	1500*
1070 diesel, can, 1971 (Rough)	2400
970, 1978 (Good)	4150
580 diesel, 1974 (Rough)	1500*

FERGUSON & MASSEY-FERGUSON

1155, 1974 (Fair)	4200*
1105, 1978 (Fair)	3175
1085, 1977 (Good)	4100*
1085, 1975 (Good)	4950*
1085 diesel, 1972 (Fair)	3300*
282, 1980 (Excellent)	7250
230, 1976 (Good)	3900
180, diesel, 1961 (Fair)	2350
175 diesel, 1973 (Fair)	2500*
175, 1973 (Rough)	1800
175 diesel, (Good)	2450*

185, 1974 (Fair)	2800*
185, 1972 (Fair)	3000
185, 1970 (Fair)	1800
185 diesel, 1968 (Good)	2950
148, 1969 (Fair)	1800
135 diesel, 1974 (Good)	2750*
135, 1973 (Fair)	2000*
135, 1972 (Good)	3450*
135, 1970 (Rough)	1750
90, 1962 (Good)	3500*
65, 1962 (Fair)	1900
35, 1963 (Fair)	1450*
35, 1963 (Fair)	1300
35, 1963 (Good)	3225
35, 1961 (Good)	1800*
35 diesel, 1961 (Good)	2200
35, diesel, 1960 (Fair)	1600*
30, 1963 (Rough)	1000

FORD TRACTORS

8800 diesel, 1971 (Fair)	4800
8800 diesel, 1968 (Fair)	3500
7600 diesel, 1979 (Good)	5250
7600, 1976 (Fair)	3950
7000, (Fair)	3200*
6000, 1963 (Rough)	1675*
5000 diesel, 1981 (Good)	4500*
5000, 1980 (Fair)	3600*
5000 diesel, 1980 (Fair)	4250*
5000, 1971 (Rough)	2950
5000 diesel, 1969 (Fair)	3550*
5000 diesel, 1967 (Rough)	1100
5000, (Good)	4100*
5000, (Fair)	3600*
5000, (Fair)	2500*
4000 diesel, 1980 (Good)	5000
4000, 1977 (Fair)	2150
4000, 1974 (Fair)	2700
4000 diesel, 1970 (Good)	3300
4000 diesel, 1970 (Good)	3200
4000 diesel, 1967 (Good)	3750
4000, 1963 (Good)	2950
4000, 1963 (Rough)	1675
3000, 1969 (Fair)	3300
3000, 1967 (Fair)	2500
3000, 1966 (Good)	5200
3000 diesel, 1966 (Fair)	2800*
3000 diesel, 1965 (Fair)	2900
3000 diesel, (Good)	3000
3000, (Good)	2850
2800 diesel, 1978 (Good)	3500*
2000, 1965 (Good)	2200
2000, 1964 (Good)	2800
1910, 1980 (Good)	6300*
641, 1961 (Fair)	2350*
640, 1958 (Fair)	2000
601, 1959 (Good)	2450
9N, 1940 (Fair)	1300
9N, 1943 (Fair)	1100
8N, 1952 (Good)	1550
8N, 1950 (Good)	1950
8N, 1949 (Good)	1700
8N, 1948 (Good)	1625
8N, 1948 (Fair)	1350
8N, 1948 (Fair)	1000
NAA, 1954 (Good)	2400
Jubilee, Bushhog, (Fair)	1300

INTERNATIONAL HARVESTER

2400, (Fair)	1325
886, 1978 (Fair)	3800*
784 diesel, cab, 1980 (Good)	5100*
784 diesel, cab, 1979 (Good)	6300*
784 diesel, cab, 1979 (Good)	5000*
784 diesel, 1978 (Good)	4700*
706 diesel, 1965 (Rough)	1000
674 diesel, 1979 (Fair)	5100*
674 diesel, 1979 (Good)	3500*
674 diesel, 1977 (Fair)	4300*
674 diesel, 1976 (Fair)	3000*
674 diesel, 1975 (Good)	2600*
574 diesel, 1978 (Fair)	3600*
574 diesel, 1977 (Good)	4000*
574 diesel, 1977 (Fair)	3250*
574 diesel, 1974 (Fair)	4100*
574 diesel, can., 1973 (Fair)	3200*
539, (Good)	5000*
484 diesel, 1978 (Fair)	4500*
454 diesel, 1972 (Good)	4000*
444, (Rough)	1700
434, 1965 (Rough)	1050
Cub, (Fair)	1200

JOHN DEERE TRACTORS

4640, 1979 (Fair)	6950*
4630 diesel, 1977 (Good)	5500*
4630, 1978 (Fair)	5600
4630 diesel, 1974 (Fair)	4500*
4630, 1974 (Fair)	4050
4230, 1978 (Fair)	3550*
4030 diesel, 1974 (Good)	4300
4020 diesel, 1970 (Good)	5600*
4020 diesel, 1970 (Fair)	2300*
4020, 1969 (Good)	4700*
4020, can., 1969 (Fair)	2900
3130 diesel, 1974 (Fair)	5400*
3010 diesel, 1962 (Fair)	1900*
2640, 1980 (Good)	5150
2440, (Good)	4400
2130 diesel, 1975 (Fair)	6100*
2130 diesel, 1975 (Good)	6000*
2130 diesel, 1975 (Good)	5000
2130 diesel, 1975 (Good)	5000*
2130 diesel, cab, 1978 (Good)	6100
2120, 1968 (Fair)	1550*
2030 diesel, 1974 (Fair)	5000*
2030 diesel, 1974 (Fair)	4050
2030 diesel, 1974 (Good)	4000*
2030 diesel, 1973 (Good)	4100
2030 diesel, 1972 (Good)	4500*
2020, 1970 (Fair)	2350
2010, 1965 (Fair)	1350
1120 diesel, 1973 (Fair)	2700*

LONG TRACTORS

1310, (Fair)	2250
384, (Good)	1550

OLIVER TRACTORS

1550, ldr., 1969 (Fair)	3500
550, 1962 (Fair)	1500
550, (Fair)	1800

WHITE TRACTOR

2-105, 1977 (Good)	4800*
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MEASURE RPM INSTANTLY Pioneer Model DT36M Digital TACHOMETER

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- Liquid Crystal Display
- Easy, Battery Operation
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- 2 Minute Memory

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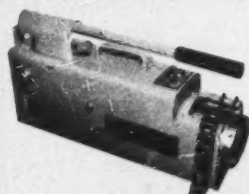
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ponents.

This simplifies integrating the two machinery lines into a single factory, and provides some cost savings by increasing volumes on individual parts.

There's a common thrust among all manufacturers—lower the retail price while maintaining factory and dealer profitability.

Tom Stadtmueller, D-A Gleaner's marketing manager, commented that the price of new machinery is a key to the market because bankers aren't allowing a purchase unless it's absolutely necessary.

"When the rotaries first came out (in the mid-70's) there was a demand for new technology. Now it's all cash flow," he said. "The custom cutter has to buy new machinery, for the reliability, while the individual farmer has to cost-justify a purchase to himself or his banker."

"We have to add value to the buyer, and increased productivity is value. That's where the engineering changes are headed."

By way of example, Gleaner recently renamed its rotary line the R series, rather than N series; major changes were a new straw spreader system, a high-reach bin unloader and a more comfortable operator seat.

The spreader prevents windrowing, making post-harvest tillage easier; the unloader permits use of taller trucks and trailers and eases unloading on-the-go; the seat reduces fatigue.

Powered feed reversers are becoming standard equipment on many models throughout the industry. Controls are being repositioned and color-coded for convenience. Electronic monitors are becoming routine; there's even automatic steering standard on the new Commandor corn models from Claas.

There's an irony in these technical improvements: the more productive the machines get, the fewer machines needed to do the job. The trend to bigger machines has also

hurt sales volumes.

"Harvesting capacity has not dropped as fast as unit volume," noted Barrie L. Smith, combine manager in Deere & Co.'s product planning and marketing department. "Our biggest combine of today has two and a half times the capacity of the largest machine from 1964."

"There's better utilization, with a farmer who owns a combine renting it out or doing custom work. On the technical side there's much greater reliability, the farmer getting through the entire harvest without a breakdown. Across the industry, those factors are reasons for a change in the market."

Smith was reluctant to predict when the combine market might rebound or how large it will get because of the many unknowable variables, but commented on how farming practices are likely to affect the industry.

"The question for the future is how we address farming as a

GOOD NEWS!

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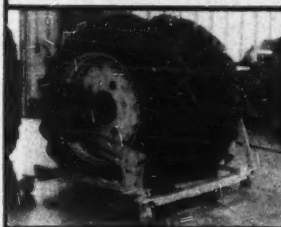
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manufacturing operation," Smith said. "Look at a factory, the way things are planned for getting materials in, organizing work flow and getting product out...farming is really in the same realm."

"A major question is how the combine affects whatever comes after it. Ridge farming, for example, requires specific wheel spacing to avoid damaging the ridges. The technology is both a problem and an opportunity as farmers look to the technology of what they do, worrying about soil compaction, controlled traffic lanes and the like."

"We need to design toward flexibility, make machines that can harvest whatever crop the market-oriented farmer needs to plant to stay in touch with demand," Smith said. "You can't have a dedicated corn combine that will harvest nothing else."

A world industry

The last five years of slumping sales and corporate consolidations

have made the North American farm machinery business an international operation, and combines are part of that movement.

Traditionally, combines were considered non-exportable between continents, except in limited numbers.

A monster Class 7 machine meant for the U.S. wheat belt simply wouldn't fit on European highways, and wasn't meant for the high density cropping practices used across the Atlantic. South Americans and Australians also had their own unique machinery needs.

But the slump in North American sales has forced some re-thinking of those notions.

Case-IH closed the old IH combine plant at Angiers, France, and supplies that market out of East Moline. Deere recently introduced here the German-built model 4425, designed for four-row harvesting. Claas imports all its machines from Germany. Massey brings in small test-plot combines from Denmark.

There's general agreement in the industry that it's impractical to ship large quantities of combines across the world's various oceans because the freight is based on volume and the machines have a lot of empty air space.

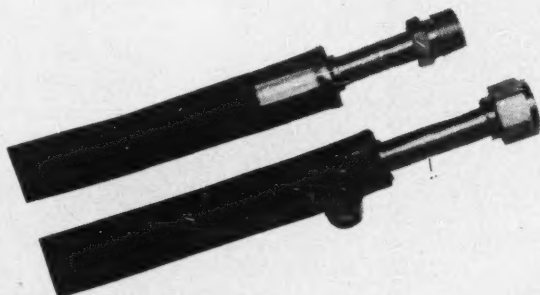
But all the companies talk about the importation of technology or major sub-assemblies to produce a competitive edge when the domestic combine market rebounds.

"We have a worldwide technical base to draw on, and we'll take advantage of that," said Brown of Massey.

Deutz-Allis acknowledges it is testing Deutz air-cooled engines for the Gleaners, and can tap combine ideas from parent KHD. New Holland has its Clayton line from Belgium, and is now part of the Ford network, which freely uses worldwide technology in its product lines. □

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The business magazine of the farm and industrial equipment industry

JUNE 1986

Tips on Buying/Selling a Business page 10

Chain Saws

Back in Dealers' Hands...?

page 32

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ANDREA SCHWARZ SRI
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Implement & Tractor

The business magazine of the farm and industrial equipment industry.

June 1986 • Vol. 101 • No. 8



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- 10:** Notes on How to Sell Off Your Business...or how to buy a business, if that's what interests you. Session for shortliners presents some solid advice.
- 14:** If Malls Sell Shoes, Why Not Tractors? That between-season slow time is not as bad for these dealers — they set up shop at a local shopping mall. And it's paying off!
- 16:** More Specialty Tractors Aimed at Market Niches. New tractor introductions seem to be following the sales curves — the 1986 crop is concentrated below 100 pto hp, with emphasis on specialty machines.
- 20:** Somebody Out There Is Smiling! FIEI Marketing & Management Conference updates its January sales forecast. A general softening is the consensus, but there's at least one happy marketer out there.
- 24:** Present and Future with George Miller. California dealer talks about a method of compensating sales people, then looks at the changing climate of selling.
- 32:** Chain Saws — Back in Dealers' Hands? The first in a series on alternate product lines takes a renewed look at a once common item handled by farm and industrial machinery dealers.

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Retail Sales: The Slump Hangs On

The April flash report on U.S. retail sales of farm equipment, issued by the Farm & Industrial Equipment Institute,

shows sales declines in all product categories except for tractors under 40 horsepower (mostly from Japan).

	Unit Retail Sales					
	April		Pct.	January-April		Pct.
	1986	1985	Change	1986	1985	Change
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	8,592	7,548	+13.8	19,693	16,900	+16.5
40-99 hp	3,315	4,216	-21.4	9,575	11,964	-20.0
100-139 hp	447	1,103	-59.5	1,814	3,263	-44.4
Over 140 hp	1,043	1,400	-25.5	3,470	4,089	-15.1
Total 2-wheel drive	13,397	14,267	-6.1	34,552	36,216	-4.6
4-wheel drive						
Under 200 hp	42	88	-52.3	207	303	-31.7
Over 200 hp	103	212	-51.4	451	574	-21.4
Total 4-wheel drive	145	300	-51.7	658	877	-25.0
Total All Tractors	13,542	14,567	-7.0	35,210	37,093	-5.1
S-P Combines	148	296	-50.0	1,161	1,436	-19.2
Balers (under 200-lb. bales)	350	496	-29.4	1,026	1,404	-26.9
Forage Harvesters (shear-bar type)	92	114	-19.3	270	423	-36.2
Mower-Conditioners	659	825	-20.1	1,967	2,287	-14.0

MF Ltd. Has New Name—Varity—And an '85 Profit

Massey-Ferguson Ltd. is changing its corporate identity to Varity Corp. But its present name and triple-triangle logo remains, assigned to its farm machinery division and other ag-related businesses.

The company reported net income of \$3.9 million on sales of \$1.29 billion in the year ended Jan. 31, 1986. This was after reorganization charges (\$17.6 million), losses from discontinued operations (\$20

million) and currency adjustments (\$8 million).

A year earlier, MF earned \$7.2 million on sales of \$1.29 billion after costs of reorganization of \$8 million, a \$31



million loss for discontinued operations and a gain of \$6 million on foreign exchange.

Effective Nov. 2, 1985, MF's Combines and Foundries Divs. became part of Massey Com-

bines Corp., of which the company owns 40 per cent.

Sales of farm tractors and equipment were about even with those of 1984 at \$804 million; industrial equipment sales were up 9 per cent at \$101 million; Perkins diesel engine sales rose 4 per cent to \$327 million.

Origin of the new corporate name: In 1892, Massey-Harris, a forerunner, acquired the Varsity Plow Works. Spelling has been changed to simplify its registration internationally, according to Victor Rice, chairman.

Case IH Plans Plant Closings

Case IH has tentative plans to close manufacturing plants at Terre Haute, Ind.; Bettendorf, Ia.; and Rock Island, Ill. If implemented, the plan calls for closing Terre Haute and Bettendorf in the last half of 1987 and Rock Island in the first half of 1988. Case IH North American manufacturing space would be cut by 25

per cent.

Planned production relocations:

Terre Haute—wheel loaders to Wausau (Wis.); large loader-backhoes to Burlington (Ia.); Burlington's skid-steer loaders to Wichita (Kan.).

Bettendorf—ag and construction cabs to East Moline (Ill.); crawler-dozers and loaders to Wausau.

Rock Island—transmissions and other components to

Racine.

Under the plan, production of some components and finished goods will go to plants in Europe and Brazil.

Jerome K. Green, president of Case IH, said that eliminating surplus manufacturing space is necessary to remain competitive and adapt to current market conditions. The three plants employ about 1,500 people.

Former Case Dealer Wins Termination Suit

A Wisconsin circuit court has ruled that J I Case Co. didn't meet the state's Fair Dealership law when it terminated a former Case dealership in Kaukauna, Wis., during the "conflict resolution" phase of the Case-IH dealership network consolidation.

Van Zeeland Implement Co. was granted a summary judgment which says Case is liable to compensate the dealership as provided in the state statute. The court said Case may have acted with good faith, but not with good cause.

An attorney for the dealership said the court ruled on April 22, and that Case and the dealership had agreed to a settlement that would preclude further appeals or other court action by either side in the case. No dollar figure for that settlement was announced.

Briefly...

Lilliston Corp. shareholders have approved the company's acquisition by Allied Products Corp., Chicago, Ill., for approximately 96,000 common shares of Allied stock. Allied shares closed May 15 at 37½ on the New York Stock Exchange.

Dickey-John's third quarter, ended Mar. 31, produced sales of \$9.9 million compared with \$12.2 million a year earlier; nine-month sales were \$27.2 million, compared with \$31.3 million in the same 1985 period. Earnings for the quarter: \$87,000, compared with \$373,000 a year earlier. Nine-month earnings: \$687,000, up from \$448,000 the year before, partly because of the sale of certain distribution rights for \$487,000.

Farm equipment exports in the first quarter of 1986 were \$407 million, down about 5 per cent from 1985's first period. Tractor and tractor parts exports (included) were up 2.4 per cent to \$210 million.

Herschel Corp., Indianola, Ia., is observing its centennial. Founded in Peoria, Ill., the company moved to Indianola, Ia., in 1974. The company's primary product lines are sickle sections, cutting parts and tillage tools. James A. Vose is president.

Forecast update:

Somebody out there is SMILING!

The consensus outlook for the industry has softened a bit since January, but there's at least one happy marketer.

By Bill Fogarty

■YOU SAY you're looking for a director of marketing who's positive and upbeat? You want one who's aggressive and determined that big things are going to happen the rest of this year and next year? You say he's hard to find?

Well, step this way, folks, because we think we've found him. And if things don't happen the way he thinks they will, he may be available before long.

We're speaking of the person—actually, it's almost certainly a number of persons—who thinks big when the forecast form comes around semi-annually for the Farm & Industrial Equipment Institute's

Marketing & Management Conference.

At this point, you should read the table featured with this report, which sets out 1985 actual sales and the 1986-87 forecasts, the one made in January and the one made in May. Note that the industry's collective marketing outlook is not generally buoyed by spring and that the median outlook for 1986 is down slightly from winter expectations.

Remember, the featured table represents a consensus of views. It's a median of forecasts by anywhere from six to 14 marketing executives, depending on product. And with that under your belt, we invite you

to consider what the high roller in each product category is predicting for the industry in 1986 and 1987:

Product	1986	1987
Tractors:		
Under 40 hp	63,000	67,970
40-99 hp	40,000	44,000
Over 100 hp	18,500	19,500
4-wheel drive	2,900	3,200
Total tractors	123,500	130,800
S-P combines	8,000	9,000
Corn heads	4,800	5,400
Forage harvesters	2,550	2,500
Balers (square)	7,500	7,500
Balers (round)	10,450	10,925
Windrowers	2,300	2,300
Mower-conditioners	12,000	12,500
Grinder-mixers	2,000	2,000

Actually, the low rollers of the league are not that far distant from the optimists on some products. Here's how the bottom end of the forecast looks:

Product	1986	1987
Tractors:		
Under 40 hp	57,000	56,300
40-99 hp	36,700	35,000
Over 100 hp	15,000	14,300
4-wheel drive	2,000	2,200
Total tractors	113,300	119,500
S-P combines	7,100	6,900
Corn Heads	3,900	4,000
Forage harvesters	2,000	1,800
Balers (square)	6,200	6,000
Balers (round)	8,550	9,025
Windrowers	1,530	1,300
Mower-conditioners	9,800	9,500
Grinder-mixers	1,700	1,600

Thus, even the doourest of predictions sees the under-40-horsepower market as holding even with its record high of 57,000 in 1985. But in a big-ticket category, such as four-wheel-drive tractors, the pessimist

(Continued on page 37)

U.S. FARM & INDUSTRIAL SALES FORECAST, 1986, 1987

(In units)

	Actual Sales 1985	January Forecast 1986	May Forecast 1986	1987
Total	57,219	58,000	58,250	59,000
Tractors	117,647	118,000	117,500	118,000
4-wheel drive	17,708	17,000	16,100	17,000
S-P combines	2,612	2,300	2,500	2,600
Corn heads	11,377	11,500	11,435	11,600
Forage harvesters	2,517	2,000	2,550	2,500
Balers (square)	6,010	6,000	4,550	4,630
Balers (round)	1,440	2,400	2,225	2,300
Windrowers	7,000	8,000	6,880	6,800
Mower-conditioners	12,000	12,000	9,500	9,830
Grinder-mixers	2,000	2,000	1,913	1,983
Other	1,200	10,000	10,700	10,900
Other	1,000	1,000	1,750	1,885

Auction Prices

Asterisk beside price indicates highest bid offered on tractors that were not sold.

JONES FARM EQUIPMENT CO. Dothan, Alabama March 25 & April 8, 1986

JOHN DEERE TRACTORS

4440, 1981 (Good)	11,750*
4440, 1981 (Good)	11,300
4440, 1979 (Good)	12,000*
4430, 1975 (Good)	7,000
4430, 1973 (Good)	7,700*
4230, 1974 (Good)	3,800*
4020, 1971 (Fair)	4,450
3130 diesel, (Good)	3,900
3010 diesel, 1983 (Fair)	2,200*
3010, 1983 (Rough)	1,600
2840 diesel, 1977 (Fair)	3,130*
2130 diesel, cab, 1977 (Good)	4,800
2130 diesel, cab, 1977 (Good)	4,300*
2130, 1975 (Fair)	4,350
2130 diesel, 1975 (Fair)	3,950*
2130 diesel, 1973 (Good)	3,700
2120 diesel, (Fair)	3,900*
2120, (Fair)	2,250
2040, ldr., backhoe 1980 (Excellent)	10,000
2030 diesel, 1975 (Good)	4,000
2030 diesel, 1974 (Rough)	1,450
2020, 1967 (Good)	3,200
2010, 1963 (Good)	2,700*
2010, 1961 (Rough)	400
1120 diesel, (Good)	3,700
1120 diesel, 1973 (Fair)	2,900*
1020, 1967 (Good)	3,000

1020 diesel, 1966 (Rough)	1,400
1010, 1962 (Fair)	1,900
1010, 1961 (Rough)	595
430, 1959 (Fair)	1,100*
40, 1955 (Fair)	550

LONG TRACTORS

1310, (Fair)	1,950
445, (Fair)	1,700
350 diesel, (Good)	1,500

FERGUSON & MASSEY-FERGUSON

T030, 1963 (Fair)	1,225
T020, 1960 (Fair)	900
2775, 1981 (Good)	5,900*
2745, 1983 (Good)	7,500
1155, 1974 (Fair)	3,800
1130, 1967 (Fair)	1,800*
1085 diesel, 1976 (Good)	3,450
285, 1975 (Fair)	3,000
275, 1975 (Good)	4,350
265, 1977 (Good)	3,900
265, 1976 (Good)	3,700
255, 1981 (Good)	4,900
255, 1977 (Good)	4,700*
245, 1977 (Good)	4,700*
175, 1968 (Fair)	3,800*
175, 1968 (Fair)	3,300
175, 1968 (Rough)	1,400
175 diesel, 1967 (Rough)	2,300*
165, 1974 (Fair)	2,800
165, 1974 (Fair)	2,850*
165, 1968 (Rough)	1,400
165 diesel, 1966 (Good)	3,500
165, 1966 (Rough)	3,100*
165, 1966 (Fair)	2,400

195, 1964 (Fair)	2,650
135, 1973 (Fair)	2,400
135 diesel, 1970 (Good)	3,300
135, 1969 (Rough)	1,750
135 diesel, 1967 (Good)	2,550
130, 1966 (Rough)	1,150
65, (Fair)	1,475
35 diesel, 1963 (Good)	1,850
35, 1963 (Rough)	1,050
35, 1962 (Fair)	1,675
35 diesel, 1962 (Fair)	1,650
35, 1961 (Fair)	1,175
35, 1960 (Good)	1,900
30, (Rough)	800
30, ldr., (Fair)	1,000
TE, 1950, (Rough)	625

CASE TRACTORS

970, cab, duals 1978 (Good)	4,100*
580, 1973 (Good)	2,000

DAVID BROWN TRACTORS

1212, 1972 (Good)	2,825
-------------------	-------

FORD TRACTORS

9N, 1941 (Fair)	965
8N, 1952 (Good)	2,100
8N, 1952 (Good)	1,925
8N, 1951 (Fair)	1,800
8N, 1951 (Rough)	1,500*
8N, 1951 (Fair)	1,475
8N, 1949 (Rough)	1,150
8N, 1948 (Good)	1,550
8N, 1948 (Fair)	1,000
Jubilee, 1953 (Rough)	1,150*
Jubilee, 1953 (Rough)	900

Jubilee, 1952 (Rough)	975
7800 diesel, 1978 (Fair)	4,800*
7000, 1967 (Fair)	5,000
6800 diesel, 1975 (Fair)	4,700
5000, 1975 (Good)	3,400*
5000 diesel, 1975 (Fair)	3,300
5000, 1975 (Good)	3,100
5000, 1972 (Rough)	2,800*
5000, 1972 (Fair)	2,650
5000 diesel, 1972 (Rough)	2,650*
5000 diesel, 1970 (Rough)	3,300*
5000 diesel, 1969 (Fair)	3,200*
5000, 1967 (Fair)	3,700
5000, 1965 (Rough)	2,550*
4810, 1983 (Excellent)	8,750
4000, 1977 (Good)	4,900*
4000, 1970 (Fair)	3,400*
4000, 1970 (Fair)	2,950
4000 diesel, 1966 (Fair)	3,250
4000 diesel, 1966 (Rough)	1,100
4000 diesel, 1964 (Fair)	3,000
4000, 1964 (Rough)	1,000
3000 diesel, 1972 (Good)	3,450
3000 diesel, 1972 (Good)	3,450
3000 diesel, 1971 (Good)	3,400
3000 diesel, 1970 (Good)	3,250
3000 diesel, 1969 (Good)	3,300
3000 diesel, 1969 (Good)	3,100
3000 diesel, 1969 (Good)	3,000
3000, 1967 (Good)	3,625
3000 diesel, 1967 (Good)	3,100
3000 diesel, 1967 (Good)	2,750
3000, 1967 (Fair)	2,700*
3000, 1966 (Fair)	3,200
3000 diesel, 1964 (Fair)	3,000
3000 diesel, 1962 (Fair)	2,600*

RUBBER TORSION TEETH FOR BEAN WINDROWERS, RAKES & BALERS

FARM FASTER
company, inc.

FOR NEW HOLLAND
Model 200 Left Hand and Model 280 Right Hand Rubber Teeth. This is a headed tooth.

EACH:
Approx. 95¢ per box. Carton occupies 1.06 cubic feet of space. 80 Units per box.

MODEL L-100-2322 LEFT
Replaces #10880-L

MODEL R-100-2324 RIGHT
Replaces #12881-R

FOR NEW HOLLAND RAKES

MODEL 008-5889
Replaces #18889 or New Holland Rake Model 50-97 & 208 Rake

This heavy duty rubber tooth will keep your maintenance costs down and eliminate broken tooth problems in raking. This is a headed tooth.

EACH:
Approx. 10¢ per box. 80 Units per box. Carton occupies 1.06 cubic feet of space.

SINGLE TEETH

MODEL 1000-488 NON-HEADED SINGLE
MODEL 1000-934 HEADED SINGLE

HEADED TOOTH SHOWN

SINGLE TEETH
For all round bar PARALLEL BAR RAKES. Will replace IHC, John Deere, New Idea, New Holland, Allis Chalmers and others.

EACH:
Approx. 40¢ per box. 80 Units per box. Carton occupies 1.06 cubic feet of space.

For BEAN WINDROWER

MODEL 1000-485
Approx. 35¢ per box. 160 units per box. Carton occupies 72 cubic feet of space. For LORAIN WINDROWERS REPLACES #10-485 & #10-486

MODEL - 1000-198
Approx. 21¢ per box. 160 units per box. Carton occupies 72 cubic feet of space. For HEATH Replaces # 985-001

BALER

FARM FASTER Model #1000-001
Replaces Versatile #2700-001 and #1000-001 for Balers Models 80-100 100-100 100-100 100-100

ALSO AVAILABLE DOUBLE TEETH
For WHEEL RAKES. Will replace Morrill, Farmhand, New Idea, Darl Rola-Rake, Model 2000-839 and most others.

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Write in (15) on Reply Card

2800, 1980 (Excellent)	5000
2000 diesel, 1974 (Good)	3600
2000 diesel, 1972 (Rough)	1150
950, 1989 (Rough)	525
901, 1958 (Fair)	925
801 diesel, (Fair)	1950
640, (Fair)	825
600, 1955 (Rough)	450

INTERNATIONAL HARVESTER TRACTORS

4365, 1975 (Fair)	3650
1486 diesel, 1980 (Fair)	3500
1088, 1977 (Fair)	2500*
986 diesel, 1972 (Fair)	2000
886, 1978 (Fair)	4000
884, ldr., 1979 (Fair)	12,550*
858, 1989 (Fair)	2800*
766, 1974 (Fair)	2400
666, 1974 (Good)	3000
664 diesel, 1973 (Fair)	3400*
656 diesel, 1972 (Rough)	2550*
784 diesel, can. 1980	4825
784 diesel, cab. 1980 (Good)	4450
784, 1978 (Fair)	5350
784 diesel, cab. 1978 (Good)	5300
674 diesel, cab. 1979 (Good)	3900*
674 diesel, cab. 1979 (Good)	3500*

YODER & FREY, INC. Archbold, Ohio April 8, 1986

INTERNATIONAL HARVESTER TRACTORS

Sup. A, 1952 (Fair)	1350
Sup. A, 1952 (Fair)	1100*
A, cult., 1954 (Rough)	1125
A, mo., 1952 (Fair)	1450
A, mo., 1951 (Fair)	900*
Cub, mo., 1949 (Rough)	1150
Cub, ldr., 1951 (Fair)	1150
Cub, mo., 1952 (Fair)	775
154 Lo-Boy, (Rough)	1550
154 Lo-Boy, (Fair)	2150*
154 Lo-Boy, (Fair)	2000
154 Lo-Boy, (Fair)	1675*
154 Lo-Boy, mo., (Good)	2750
H, 1950 (Fair)	750
H, 1953 (Good)	950*
H, 1947 (Rough)	450*
H, 1950 (Rough)	450
H, 1949 (Fair)	625
H, 1948 (Rough)	440*
H, 1949 (Rough)	340*
H, 1951 (Rough)	320*
H, 1945 (Rough)	500
M, 1947 (Fair)	925*
M, 1952 (Rough)	725
M, 1950 (Rough)	300*
Sup. M, 1952 (Fair)	800*
Sup. M, 1953 (Fair)	800
F-12	115
C, 1951 (Fair)	1458*
C	300
C, mo., 1949 (Rough)	1000*
140, cult., 1961 (Fair)	2200*
100, 1957 (Fair)	1250*
100, cult., 1955 (Fair)	1500*
40, 1958 (Fair)	1700
400 LP, 1955 (Fair)	600*
400, 1955 (Fair)	900*
400, 1954 (Fair)	770
450, ldr., 1958, (Fair)	1175
460 diesel, 1982 (Fair)	1500*
460, 1959 (Fair)	900*
460, 1959 (Fair)	1075
460 diesel, 1958 (Good)	1100*
460, 1959 (Rough)	1100*
580 diesel, 1961 (Rough)	1000*
574, 1975 (Good)	4100*
606, bld., 1963 (Fair)	3000*
656, 1989 (Fair)	2575*
656, 1986 (Fair)	3200*
656, 1987 (Fair)	2300*
666 diesel, 1973 (Good)	5500*
666, 1974 (Good)	4400*

674, 1978 (Good)	5200
674 diesel, 1978 (Good)	4875
674, 1978 (Good)	3600
674 diesel, 1978 (Good)	3400*
674 diesel, 1977 (Good)	4000
674, 1978 (Rough)	3600*
674 diesel, 1976 (Good)	3100*
574 diesel, 1978 (Good)	3000
574, 1977 (Good)	5300
574 diesel, cab. 1977 (Good)	4975
574 diesel, can. 1977 (Good)	4000
574 diesel, cab. 1977 (Good)	3800*
574 diesel, can. 1977 (Good)	3800*
574 diesel, 1975 (Fair)	3800*
574 diesel, 1974 (Good)	4100
574 diesel, 1974 (Good)	3400*
574 diesel, 1973 (Rough)	3950*
484 diesel, cab. 1978 (Good)	4000
454 diesel, can., 1972 (Good)	4000
454 diesel, 1972 (Good)	2800*
424, 1965 (Good)	1700
404, 1962 (Fair)	800
300, (Rough)	875
B275 diesel, (Rough)	500
Sup. A, equip., (Fair)	1400
Sup. A, 1954 (Fair)	450
H, 1941 (Rough)	350
100, equip., 1955 (Fair)	1600

674, 1973 (Fair)	3800*
674, 1975 (Good)	4500*
674, 1973 (Good)	4300*
674, 1973 (Good)	4500
684, 1980 (Good)	5700*
686, 1978 (Fair)	6800*
706, 1965 (Fair)	2900*
706, 1964 (Fair)	900*
706, 1964 (Rough)	1000*
706 diesel, 1966 (Rough)	4100*
706, 1964 (Fair)	1900*
706, 1964 (Good)	2800*
756, 1968, (Fair)	3500*
756 diesel, 1970 (Good)	4900*
766, 1974 (Fair)	3750*
786 diesel, 1975 (Fair)	5000
784, 1980 (Good)	5700*
784, 1979 (Good)	5700*
784, 1977 (Good)	5800
784, 1977 (Rough)	3200*
806, 1964 (Fair)	2700
806 diesel, 1964 (Rough)	2200*
806 diesel, 1965 (Rough)	2500*
806 diesel, 1963 (Fair)	2100*
806, 1967 (Fair)	2150*
806 diesel, 1965 (Good)	3750*
826 diesel, 1973 (Good)	4300*
826 diesel, 1968 (Fair)	4100*
856 diesel, 1969 (Fair)	4600*
856 diesel, 1970 (Fair)	3950*
856 diesel, 1969 (Good)	4000*
856 diesel, 1968 (Fair)	3350
856 diesel, 1965 (Fair)	2200
966 diesel, 1971 (Fair)	4800*
966 diesel, 1974 (Good)	6500*
986, 1977 (Fair)	8300*
986 diesel, 1978 (Good)	10,450
986 diesel, 1978 (Excellent)	12,000*
1066, 1975 (Fair)	6800
1066, 1975 (Fair)	7150
1066, 1974 (Fair)	5800*
1066, 1974 (Good)	5450
1066, 1976 (Good)	6300
1066, 1975 (Fair)	3800
1066, 1978 (Excellent)	13,250*
1066 diesel, 1979 (Excellent)	14,400
1206, 1966 (Rough)	2500*
1206 diesel, 1964 (Fair)	3300
1206 diesel, 1965 (Rough)	2750*
1256 diesel, 1971 (Good)	5250
1586, 1979 (Fair)	10,500
1586, 1980 (Good)	6750*
1586 diesel, 1978 (Good)	10,100
3266 diesel, 1983 (Excellent)	9800*

STEIGER TRACTORS

Bearcat II, duals (Good)	9000*
Bearcat II, (Fair)	9500*

(More...)

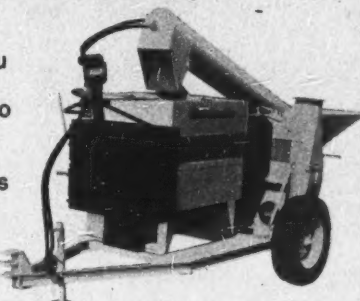
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Write in (16) on Reply Card

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Our new equipment designed for compact tractors widens your potential market. We help you sell with liberal terms, co-op advertising and sales aids. And, you can count on us to be here tomorrow to service what we manufacture today. Give us a call, let us show you how we can help you improve your profit picture, automatically!

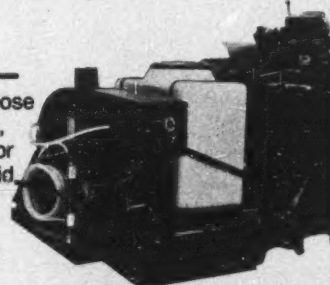


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A sprayer for any purpose — pastures, rowcrops, orchards, vegetables, or foliar feeding. PTO, skid, and trailer mounts for tractors as small as 12 h.p.



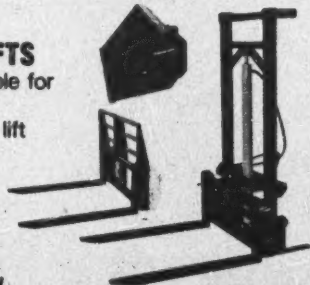
SOILMOVER SCRAPERS —

There's one to work with farm tractors from compact on up. Capacity from 1/2 to 14 cu. yd., for tractors from 12 h.p. on up.



TRACTOR FORK LIFTS

— Two models available for Category I & II and for Category III tractors to lift and move anything.



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Automatic

Call toll free: 800-228-9289. Ask for Ike. In Nebraska (402) 385-3051

Auctions

(continued)

MINNEAPOLIS-MOLINE TRACTORS

Jet Star 5 diesel, 1962 (Fair)	900*
U-302 LP, 1965 (Fair)	2500*

FERGUSON & MASSEY FERGUSON

35, 1960 (Fair)	1800*
35, 1967 (Fair)	2050
36 diesel, 1960 (Rough)	1800*
35, 1960 (Fair)	2000
85, 1961 (Rough)	800*
85, 1969 (Fair)	1550
165 diesel, 1972 (Fair)	3000
175 diesel, 1967 (Fair)	4800
285, 1979 (Fair)	5400*
1080, 1973 (Fair)	3425
1100 diesel,	1435
1130 diesel, 1969 (Rough)	2000*
1135 diesel, 1974 (Fair)	4000
1155 diesel, (Fair)	4200*
2745, 1960 (Excellent)	11,250*

JOHN DEERE TRACTORS

B, 1941 (Rough)	375*
B, 1941 (Rough)	550*
D, 1945 (Fair)	1725*
AP, 1950 (Rough)	400*
60, 1953 (Rough)	375
60, 1953 (Fair)	950*
60, 1953 (Fair)	850*
70 diesel, 1955 (Fair)	750
520, 1966 (Fair)	1525
530, 1968 (Fair)	1500*
630, 1959 (Rough)	1050
2010, 1962 (Fair)	1620*
2020 diesel, ldr., 1970 (Rough)	4100
2940 diesel, 1980 (Good)	9200*
3010 diesel, 1961 (Rough)	2100
3010 diesel, 1962 (Good)	2900
3010, 1962 (Fair)	2400*
4010, 1965 (Rough)	3500
4010 diesel, 1962 (Fair)	3200*
4020 diesel, 1968 (Rough)	4050
4020 diesel, 1971 (Good)	6000*
4020 diesel, 1969 (Good)	5300*
4020 diesel, 1967 (Fair)	4400*
4020 diesel, 1965 (Good)	4600*
4020 diesel, 1968 (Fair)	6000
4230 diesel, 1973 (Fair)	8150*
4230 diesel, 1974 (Fair)	8250*
4230 diesel, 1965 (Fair)	3850
4430 diesel, 1980 (Good)	9800*
4430 diesel, 1976 (Good)	10,500*
4430 diesel, 1975 (Fair)	10,000*
4440 diesel, 1981 (Good)	8500
4440 diesel, 1980 (Excellent)	19,000*
4520 diesel, 1973 (Fair)	4750*
4620, 1973 (Good)	5800
4630 diesel, 1976 (Good)	9600
4630 diesel, 1977 (Excellent)	11,000*
5020 diesel, 1971 (Fair)	4300

DEUTZ TRACTORS

D6006, (Fair)	3700*
D5506, ldr. (Fair)	3900
D10006, 4WD. (Fair)	4250*

FORD TRACTORS

8N, 1947 (Fair)	1300*
8N, ldr., 1952 (Fair)	2250
8N, 1961 (Fair)	850*
8N, 1960 (Rough)	950*
9N, 1942 (Rough)	875*
9N, 1944 (Rough)	850*
Jub., 1954 (Rough)	1800*
860, 1956 (Fair)	1800*
800, 1955 (Good)	2400*
4000, 1965 (Rough)	2450*
500 diesel, 1973 (Fair)	4250*
5000, 1968 (Fair)	4800*
5000, 1975 (Fair)	4900*
8600 diesel, 1974 (Rough)	4800*
9600 diesel, 1975 (Rough)	4400*

COCKSHUTT TRACTORS

1850, 1967 (Rough)	2300*
1250, ldr., 1967 (Rough)	1350

CASE TRACTORS

430, 1966 (Rough)	1300*
630, 1961 (Fair)	1525*
630, 1965 (Rough)	1650
630, plow, 1965 (Rough)	1200*
730, 1963 (Rough)	1100*
770, 1970 (Fair)	2500*
630 diesel, 1964 (Rough)	925
970, 1974 (Fair)	5500*
1030 diesel, 1967 (Fair)	3100
1070 diesel, 1975 (Fair)	5900
1270 diesel, 1974 (Fair)	5000*
1370 diesel, 1976 (Rough)	4700
1470TK diesel, (Fair)	4800
1570 diesel, 1977 (Rough)	6700*

OLIVER TRACTORS

1365, ldr., 1975 (Rough)	2950
1550, 1965 (Rough)	1550
1600 diesel, 1963 (Fair)	1900*
1650, 1965 (Fair)	1850
1650, 1967 (Fair)	1700*
1750 diesel, 1968 (Rough)	2000
1800, 1964 (Fair)	2850
1800, 1962 (Rough)	1100*
1850, 1967 (Rough)	1300*
2255 diesel, 1974 (Good)	7450

DAVID BROWN TRACTORS

DB 1412, 1976 (Fair)	5600*
1200, 1971 (Fair)	2800*
865, 1976 (Rough)	2850*

ALLIS-CHALMERS TRACTORS

WC, 1936 (Rough)	120
WC, 1937 (Rough)	385
WD-45, 1956 (Fair)	550*
WD-45, 1957 (Fair)	950
D-17, 1966 (Fair)	1700
D-17, 1967 (Good)	2400
170 diesel, 1972 (Rough)	3000*
190XT diesel, 1968 (Fair)	2500*
190XT diesel, 1972 (Fair)	3600*
190XT diesel, 1971 (Fair)	3500
190XT diesel, 1971 (Fair)	3500
200 diesel, 1973 (Fair)	4900*
220 diesel, 1972 (Rough)	2850*
7060 diesel, 1976 (Fair)	6200*

NOTES:

Prices reported are for individual sales at wholesale on an "as is," "cash and carry" basis. Prices reported are not averages.

Condition Classifications:

EXCELLENT: Engine in perfect condition, 400 to 600 hours of use. Rubber—80% tread remaining, no breaks or cracks. Paint—original and bright. General appearance: excellent.

GOOD: Engine in good running condition. Rubber—70% tread remaining, no breaks or cracks. Paint—original or a good repaint job. General appearance: good over-all.

FAIR: Engine possibly in need of a minor overhaul. Rubber—60% tread remaining, some cracking evident in sidewalls. Paint—only fair, weathered and some rust apparent. General appearance: worn, some dents, minor parts (gag covers, etc.) missing or broken.

ROUGH: Engine obviously in need of a major overhaul. Rubber—smooth. Paint—scarred, weathered, rusty. General appearance: dents, ruptures, broken parts, loose wires, components (such as lights) broken, missing or inoperative.

Write in (17) on Reply Card

Forecast Update

(Continued from page 20)

sees a market that's only two-thirds the size of the optimist's forecasts.

Other field equipment

There are no mentions of unit sales on some product lines, only percentages of change. This means that if forecasters of such items as tillage equipment and farmstead products are vastly wrong, or right, the secret is safe. The consensus on tillage:

Moldboard plows, down 5 per cent in 1986, no change next year; disk harrows, no change this year, up half a percentage point in 1987; field cultivators, same as disk harrows; chisel plows, no change this year, up one per cent in 1987.

Manure spreaders are forecast to go down 5 per cent this year and hold steady next year.

Agri-equipment

Over in the Agri-Equipment Div. of FIEI, the forecasts are expressions of percentage of change, with no mention of unit numbers. Thus, we'll never know how close the individual forecasts of volume increases of 100 per cent (that's right!) in the grain bin and in-bin crop dryer markets come to fulfillment.

But even if these sunny outlooks are discarded, the median among grain bin marketers is for a solid 15 per cent hike in sales this year, holding steady next year; and the in-bin dryers are seen as rising 5 per cent.

No change in 1986 or 1987 is seen for milking machines, for batch-type and continuous-flow dryers or for augers and elevators.

Industry outlook

Estimating the change in retail dollar volume for the industry in 1986, the participating marketers expect business to decline 4.3 per cent. Of the 48 survey respondents, six see an upturn of from two to 15 per cent; 11 see no change and 31 expect declines of from two to 10 per cent.

The State of the Industry outlook report was delivered last month by James Gaeddert (Hesston) at the FIEI's Marketing & Management Conference at Iowa State U. FIEI is headquartered at 410 N. Michigan Ave., Chicago, Ill. 60611, telephone 312/321-1470. □

California Dealer

(Continued from page 25)

"Dealers will try to be aware of specific buyers' needs. They will become the target accounts. Those buyers will require, have the finances to buy, and the management ability to use, available machines profitably.

"I expect to increasingly study and select prime, potential customers. Then we will make it a point to contact them frequently, to key specific direct mail pieces to their interests and to cultivate those accounts in all possible ways. We will limit our demonstrations to selected potential customers, not use demonstration time on just anyone who comes in the door. We will determine the individual's ability to use and buy the machine before putting it out for trial."

The dealership has used this system already and has achieved positive results with its demonstration of tomato harvesters in conjunction with its supplier, FMC.

"We put a great deal of effort into those tomato harvester demonstrations and they paid off with sales of three of those big-ticket machines for this coming season," Miller says.

Personal contact

"With the type farmers we serve, we do not see group meetings and open house programs as being overly productive. We find personal contact with key personnel in specific accounts as being the tool with which to sell machines."

Miller believes dealers will find it necessary to put customers on a cash basis much sooner than they might have done in the past. "We are continually weeding out the marginal accounts on which we could be hurt," he stresses.

He, as with many other dealers, feels inventory control is of utmost importance. "Watch that your suppliers do not attempt to load you with new goods that have a definite possibility for going to 'interest-bearing' terms. I'll guarantee we are keeping a close eye on what we stock in the yard."

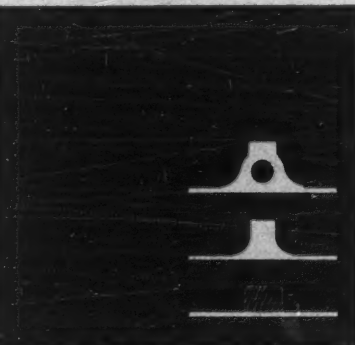
Miller feels a good year's annual volume for the operations he heads is about \$4 million, of which parts sales at the two stores top \$1.2 million, operating with a \$250,000 parts inventory. □

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Implement & Tractor

The business magazine of the farm and industrial equipment industry

JULY 1986

Focus: Rotary Cutters, Disk/Drum Mowers page 12

**Small Dealership Is Big
On Buying, Selling for Cash** page 8



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Dealer Conventions, Major
Farm Equipment Shows
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IMPLEMENT & TRACTOR

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Implement & Tractor

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7: Selling Safety (and Safety) in the New Chain Saw Market. This second part of a look at chain saws as an alternate product line offers tips for selling within the spirit of new safety guidelines for the industry.

8: Small Dealership Is Big On Buying/Selling for Cash. By paying MF on delivery for small tractors, the Griesenauer brothers figure they can offer a competitive price, generate good volume and hold a fair margin.

12: Good News! They Still Have to Cut It! Two different equipment types—rotary cutters and disk/drum mowers—share the distinction of showing strength in a generally down market.

20: 1986-1987 Industry Conventions, Meetings, Machinery Shows. I&T's annual compilation of dealer associations' conventions, major farm equipment shows, and other trade events.

25: Ideas for Liquid Manure Disposal. More on the problems of manure disposal (see I&T March). Britain's Muck '86 is the subject of this picture story.

On the cover... The smiling faces of Ralph and Ed Griesenauer attest to their success at selling MF tractors at the O'Fallon Garage dealership in O'Fallon, Mo.

DEPARTMENTS

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Little Sunshine in May's Retail Sales

The retail sales flash report for May from the Farm & Industrial Equipment Institute

showed that volume was down in all categories but one—not under-40-hp tractors from Japan this time but two-wheelers of 140 horsepower and over.

	Unit Retail Sales					
	May		Pct.	January-May		Pct.
	1986	1985	Change	1986	1985	Change
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	7,058	7,390	- 4.5	26,701	24,290	+ 9.9
40-99 hp	2,586	3,904	-33.8	12,154	15,868	-23.4
100-139 hp	477	731	-34.7	2,282	3,994	-42.9
Over 140 hp	1,059	863	+22.7	4,522	4,952	- 8.7
Total 2-wheel drive	11,180	12,888	-13.3	45,659	49,104	- 7.0
4-wheel drive						
Under 200 hp	43	94	-54.3	251	397	-36.8
Over 200 hp	70	168	-58.3	530	742	-28.6
Total 4-wheel drive	113	262	-56.9	781	1,139	-31.4
Total All Tractors	11,293	13,150	-14.1	46,440	50,243	- 7.6
S-P Combines	133	473	-71.9	1,295	1,909	-32.2
Balers (under 200-lb. bales)	366	908	-59.7	1,395	2,312	-39.7
Forage Harvesters (shear-bar type)	89	198	-55.1	359	621	-42.2
Mower-Conditioners	790	1,635	-51.7	2,778	3,922	-29.2

It Will Be Ford New Holland

Ford Motor Co. has announced a reorganization which establishes Ford Tractor Operations in the U.S. as a wholly owned subsidiary, effective January 1, 1987. The new company will be called Ford New Holland, Inc. Ford Tractor in the United Kingdom is to become a wholly owned subsidiary of Ford Motor Co. Ltd. and known as Ford New Holland, Ltd.

Robert F. Moglia, Ford vice-president and general manager of Ford Tractor Operations since 1984, will be president of Ford New Holland, Inc., which will continue to report to Ford's Diversified Products Operations.

The New Holland business, acquired from Sperry Corp. in 1985, will report to Ford New Holland, Inc. The combined operations will have annual revenues in excess of \$2 billion.

Survey: Domestic Carbon Steel Getting More Competitive

Is foreign steel getting less competitive? Monthly surveys by the Steel Service Center In-

stitute, Cleveland, Ohio, indicate a sharp change has taken place in the second quarter of 1986 compared with previous periods, and that domestic steel has become substantially more competitive.

Each month, the Institute surveys steel service centers and asks how foreign mills' offering prices on carbon steel compare with domestic delivered prices. For the 15 months from January, 1985, through March, 1986, an average of about three of every four steel centers found the overseas offerings from 6 to 10 per cent cheaper than domestic prices. About one in seven found prices anywhere from 5 per cent cheaper to 5 per cent more, or about equal.

But in April, the picture changed. Prices were found to be about equal by 37 per cent of the correspondents; 57 per cent found the foreign offerings 6 to 10 per cent cheaper. In May, 39 per cent said prices were about the same, 61 per cent said foreign steel was 6 to 10 per cent cheaper.

And in June, more than half the respondents—52 per cent—found the price of domestic steel on about an equal footing with the product of foreign mills; 48 per cent found the imported steel 6 to

10 per cent cheaper.

Andrew Sharkey, SSCI president, told I&T: "It looks like a significant change, but it's still early. We'll know more about it in several months."

Steiger Tractor Files Under Chapter 11 Of Bankruptcy Code

Steiger Tractor, Inc., filed for protection from creditors June 17 under Chapter 11 of the U.S. Bankruptcy Code. The petition includes the parent company and its subsidiaries, Steiger Credit and Integrated Technical Systems, but not its Canadian and Australian operations.

The parent company reported assets of \$54 million, \$30 million in liabilities and shareholder equity of \$24 million, including book value of the parent's investment in its subsidiaries. Steiger Credit has assets of \$37 million and \$23 million in liabilities. Integrated Technical Systems reported assets of \$541,000 and liabilities of \$677,000.

Steiger Tractor is 25 per cent owned by KHD, Cologne, West Germany, the parent company of Deutz-Allis. The company asked the court to be

Deere's 1st Half: Sales Off 9 Pct. At \$1.7 Billion

Deere & Co. had losses of \$33.4 million in the second period of fiscal 1986 (ended April 30) and \$67.8 million for the first half, compared with income last year of \$34.8 million for the quarter and \$6.6 million for the half.

Worldwide sales for the quarter were \$1.023 billion and for the first half, \$1.7 billion, both down 9 per cent.

Trade receivables, mostly dealer inventories, were \$2.866 billion April 30, 1986, down \$132 million from a year earlier. North American ag inventory declined \$286 million in the past 12 months and \$138 million since the start of the fiscal year.

Robot Milking 5 Years Away?

Dairy cow yields could rise by up to 20 per cent when robots take over the milking, according to Britain's National Institute of Agricultural Engineering. Experimental designs would operate entirely without human help around the clock, leaving cows free to choose milking times and frequencies.

NIAE says that when cows choose a frequency of three to four times daily, yield increases of up to 20 per cent can result.

John Matthews, NIAE director, said a commercial version could be available in five years.

allowed to maintain its warranty obligations and to use cash from operations to continue paying employees and incur new financial obligations. Steiger plans to continue production.

Varity (MF) 1st Quarter Sales: \$346 Million

Varity Corp., the newly-renamed Massey-Ferguson, posted net sales of \$346 million in the first period of 1986 (ended April 30), a \$40 million increase. Earnings went from \$400,000 to \$5.9 million.

The company's former Com-
(Continued on page 16)

Focus on two product areas — rotary cutters, disk/drum mowers:

GOOD NEWS! THEY STILL HAVE TO CUT IT!

Two different equipment types, they share the distinction of showing strength in a generally down market. By Bill Fogarty

■WRITING a market focus story in the farm equipment business today can be discouraging. It has taken a bit of a search to find one with some sunny aspects to it, but we've done it. And it's encouraging.

The essence of our good-news message is the title of this article. Farmers and others have to mow things—roadsides, pastures and hay—and in at least some product categories, they have been buying the equipment to do it.

A look at hard numbers from a couple of sources indicates that the 1980s have treated the rotary cutter and drum and disk mower segments of the market far better than other

products in the farm equipment mainstream.

Rotary cutters

Table I shows what has happened in the rotary cutter market over the five most recent years for which manufacturer shipments data are available. The smallest sizes (under 66 inches) have been moving up. Medium-size units (66 to 100 inches) have held steady. Even the largest ones (over 100 inches) appear to have avoided the severe drops that other product categories have experienced.

Rotary cutter manufacturers agree that the growth of the part-

time farmer phenomenon has been the major factor in the small-unit sales increase. Joked one sales manager:

"Heck, I haven't made any money off *real* farmers in years, just these part-timers who are fooling around."

Said another: "About anything connected with tractors under 40 horsepower is selling well. These cutters are what many people need for mowing pastures."

"Most of our sales," observed a marketing manager, "are through used equipment dealers. They sell them along with units like Ford 8N

(More...)

There's more, but...



Manufacturer shipments data from USDC also show a busy record of growing shipments for Stalk Shredders (under 90 inches) for the same five-year period. But are they really stalk shredders or are they small, flail-type mowers, used for a variety of needs closely paralleling the uses for rotary cutters? Shipments of the under-90-inch "stalk shredders" were: 1980—9,751 units; 1981—7,656; 1982—10,225; 1983—16,359; 1984—18,844.

Shipments of parts for rotary mowers and "stalk shredders" are combined. Expressed in dollar values, they are: 1980—\$17 million; 1981—\$25 million; 1982—\$20 million; 1983—\$22 million; 1984—\$24 million.

TABLE I: LOOK AT THE ROTARY MOWER MARKET!

(Manufacturer shipments, horizontal blade type, excluding lawn types)

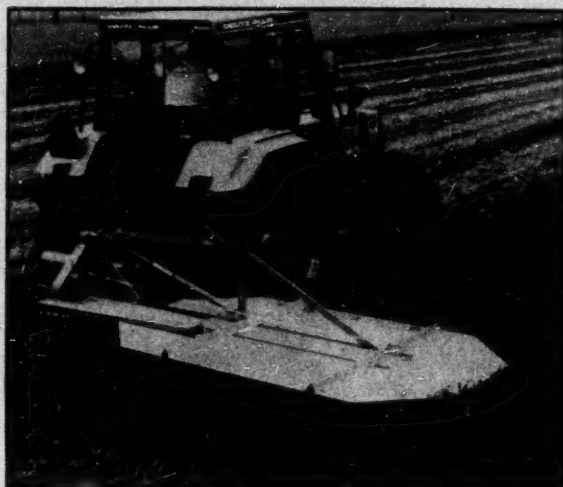
Year of Shipments	Size of Swath			Value of Shipments (millions)
	Under 66 inches	66 to 100 inches	Over 100 inches	
1980	49,517	18,226	7,834	\$75.8
1981	43,258	17,000	8,868	76.9
1982	49,806	13,645	4,982	89.2
1983	64,372	17,110	7,038	88.4
1984	71,099	17,964	5,407	82.9

Source: U.S. Dept. of Commerce, Current Industrial Reports, Farm Machinery and Lawn and Garden Equipment (MA35A).

Rotary Cutters, Disk/Drum Mowers

(continued)

Reading the numbers...



Not all units shown as mower imports are of the disk/drum type, but almost all the units from France, West Germany, Italy and the Netherlands are. There's another product category that lumps together "harrows, rollers, stalk cutters, soil pulverizers," and this is believed to include a large quantity of rotary cutter imports from Deere's Welland (Ont.) Works.

TABLE III—PRINCIPAL SOURCES OF MOWERS

(in thousands)

Year	France	Italy	West Germany	Netherlands
1982	2,413	51	2,572	98
1983	2,482	708	3,987	840
1984	5,081	732	4,821	1,536
1985	5,424	2,482	5,787	1,803

Source: U.S. Dept. of Commerce, International Trade Administration, Office of Capital Goods and International Construction.

TABLE II—THE MOWER IMPORTS

(excluding lawn mowers)

Year	Units Imported	Value of Imports (thousands)
1980	17,912	\$25.8
1981	14,825	\$4.5
1982	14,370	\$5.0
1983	10,488	\$9.3
1984	14,711	\$1.1
1985	17,140	\$2.5

Source: U.S. Dept. of Commerce, International Trade Administration, Office of Capital Goods and International Construction.

tractors. About 10 per cent go through Kubota or Deere or similar dealers."

The larger segments of the rotary cutter market have changed over the years. There was a time when about every field of row crops was shredded, noted one manufacturer executive, "but the practice gave way to heavy disking and leaving a large

part of the crop on top of the soil."

Today, he noted, the typical buyer of a larger rotary is the cow-calf farmer who's mowing pasture. "They're getting by, they can buy something. But the loss of the row crop markets took some manufacturers out of the business."

Said one sales manager: "You go after the weekend farmer or you go for the big machine buyer, the ones who are better financed, and for the roadside maintenance market."

He added: "Some farmers have been able to overbuy their rotary mowers. These are the ones who have been getting money from stripper oil wells on their land (in Southwestern states). But that business is about gone, so we'll be going hard after roadside mowing prospects and, more than ever before, the small user market."

In and out. It's not too hard to get into the manufacture of rotary cutters. Said one sales manager: "Buy yourself a gearbox, buy a blade, go over to Sears and get about \$500 worth of tools, and you're in business."

"The smaller sizes are not difficult to get into," said Robert Moore, sales vice-president for Bush Hog. "When you start adding hydraulics

and flexible wings, it gets complicated."

Back in 1963, when I&T reviewed the rotary cutter market, it was estimated that there were around 125 manufacturers of the product type on the market. We had assumed that this number would be down by about 60 to 70 per cent over the decades as a result of the usual economic forces that tend to thin out ranks of producers.

"It's not much below what it was years ago," remarked Phil Fraley of King Kutter, Winfield, Ala. "If you had 125 back then, there must be close to 100 now."

But if the total number of players is not down much, the actual roster has changed. About one-fourth of the rotary cutter marketers listed in I&T's 1963 Product File are apparent in the 1986 edition.

Hank Kaspar, marketing manager for Hesston's Woods Div., a long-time veteran of the business, notes that a lot of small producers of rotary cutters have come in and gone out in the past. "We assume," he said, "that competition will always be with us. Some smaller companies will probably be clipped by product liability losses or insurance premiums and will drop

out, but others may rise up in their place."

Product liability. There it is again, product liability.

"We're getting insurance premium increases of 400 to 700 per cent," noted Robert Moore, sales vice-president for Bush Hog, Selma, Ala.

"It's not just the premium costs that add percentage points to the price of the product," commented Joe Pryor of Rhino Products, Dallas, Tex. "I've been spending weeks getting ready for a lawsuit, and that's costly. Our coverage has been reduced and our premium has been raised."

Said Hank Kasper of Woods: "Just to give you an idea of what's necessary, we have one man who's in charge of safety and reliability. He's involved with everything—training, depositions, etc. And he used to be our chief engineer."

Phil Fraley of King Kutter: "We have been sued in the eight years we've been in the business, but never had any losses. Nevertheless the premium increases have been stiff."

Imports. Rotary cutters have largely remained a domestic item. Some components, through, are sourced both overseas and in North America, such as gearboxes.

Rotary cutters, according to some manufacturers, don't appear to be a likely target for competition from overseas because they are not very labor-intensive and the amount of space they take up in relation to dollar value is relatively high, affecting the freight bill and, ultimately the price.

Manufacturers agree, however, that if the product liability cost situation continues to darken for American producers, the picture could change. "An overseas company," said one, "with nothing to lose beyond inventory assets it had over here, could decide to go bare on product liability. That could make their product very competitive with American lines, and there would go more jobs overseas."

Regardless of any threat of import competition, it is said that some smaller manufacturers of rotary cutters are now going bare themselves on product liability insurance.

Outlook. As long as the trend toward small farms and similar holdings continues in North America, the need for the utilitarian services of small-swath rotary cutters should continue. The growth in sales of small tractors from Japan is just one indicator of this, for manufacturers are finding new sales opportunities based on the increasing popularity of all-terrain vehicles.

Watch for more standardization of safety features such as shielding chains, particularly for non-agricultural applications.

Disk and drum mowers

In 1977, I&T did a brief report on what we called "Euromowers," the drum and disk types that were just getting a foothold in North American hay crops. About 3,500 to 4,000 units were being imported annually at that time.

Today, the total is probably around 15,000. A look at Tables II and III tells the story, even though the Commerce Dept. numbers don't distinguish between mower types.

Further, mower-conditioners with disk-type cutterbars are believed to be getting somewhere between 20 and 30 per cent of U.S. retail sales in that product category.

The major producers are Deutz-Fahr and Krone (KMN) in West Germany; Lely, Vicon and Zweegers (PZ) in the Netherlands and Kuhn in France. Several North American companies, such as Gehl, New Holland, Deere and Hesston market such units under their own names.

The Euromowers originally got started in this country because they met a need their original designers never thought of. Infestations of fire ants have left mounds of dirt across hayfields in the Southern U.S. Sicklebar mowers have plugging and damage problems under such conditions; the Euromowers don't.

The disk and drum mowers also do well in heavy and wet grass crops such as are found in the South and East. In alfalfa, under ordinary or favorable conditions, the sicklebar mower continues to prevail. Thus, not many Euromowers have been sold in the Midwest, but the number



Joe Weickes, New Holland's product manager for hay tools, shows the two main ways hay is cut in America. He says there's nothing to beat the sicklebar in standing alfalfa, but there are problem areas where the spinning disk is preferred: fire-ant mounds; heavily fertilized grass crops; soft, wet grass, etc. In a sparse alfalfa crop, a disk cutter could produce a streaky stubble, he says, because the air blast from the rotating disks bends the crop over.

Mowing speed with disk types is determined by the operator's ability to stop the tractor in an emergency, not by cutting ability.

is growing, and the feelings about some of these sales are mixed.

"We get some sales in the North Central states," said a sales manager, "because farmers occasionally have trouble with their first hay crop of the season due to weather, and they would rather have a disk mower than a sicklebar type."

Worrisome application. Some Euromowers are now being sold in the North Central states and elsewhere for roadside mowing. "But this isn't what they are designed for," the sales manager asserted, "and we don't recommend that they be used that way. The concern is safety."

The Euromowers are usually draped with fabric, which is sufficient to control the movement of the cut hay crop. Typical roadside debris—metallic or glass objects hurled by mower blades—suggest frightening hazards to safety engineers, and so at least some companies are discouraging such applications.

(More...)

Rotary Cutters, Disk/Drum Mowers

(continued)

One company told I&T, however, that development is now under way on a disk-type roadside mower, *i.e.*, one with enough guarding to provide a level of protection satisfactory to engineers and insurers. If plans work out, it could be introduced in a few months.

Pricing. Marketing managers and sales reps who were introducing Euromowers to dealers a decade ago had to use very intense and persistent sales and demonstration methods to draw attention to their products' advantages.

One factor that got progressively easier was price. The dollar kept rising in relation to European currencies from late in the 1970s until 1985. Since then the trend has been in the opposite direction.

"We had been having price cuts

over the past four years," said Tim Harman, sales manager for Kuhn Farm Machinery, Inc., Vernon, N.Y., subsidiary of the French manufacturer. This year we're having our first price hike since 1982, about 7 to 8 per cent."

Outlook. Dry weather in the Southeastern U.S. has cut into this year's sales. "Over the long haul, however, these things tend to level themselves out," notes Alan Tarver, who distributes the PZ line across the Southern states. "Business has been good west of the Mississippi and will improve in the East."

One of the features of Euromowers that bodes well for their future is their speed, particularly in relation to the farmer's time available for making hay. Taking a disk or drum mower into a

field and opening up the tractor has always been an effective sale closer. Time always squeezes the farmer, and speed becomes even more important when he is involved with a job in town.

I&T reported in March about lab research at Purdue U. on the use of hay disks to harvest soybeans. If such research leads to widespread application eventually, it could open new opportunities for manufacturers and dealers alike.

Summing up. There you have upbeat looks at two of the brighter product areas within the generally slow North American farm equipment business. Anybody who is involved in either will assure you that the field is very competitive, but that's to be expected even in the best of times. □

Update

(Continued from page 4)

bines Div. has become Massey Combines Corp., of which Varity owns 45 per cent. Results for Varity's first period of 1985 have been restated to show the former division as discontinued operations.

The \$40 million sales increase, adjusted for exchange rates, was 7 per cent. Of the \$346 million total, the farm and industrial machinery segment was \$254 million and engines, \$92 million. The largest market, the United Kingdom, had sales of \$63

million, up 6 per cent; the U.S. volume, \$55 million, was up 1 per cent.

New Posts at Case for Gleason, Christman, Rosen, Schulz, Breeze

At J I Case Co., executive changes have been announced:

John S. Gleason is in the new post of senior vice-president, North American sales and marketing; Richard M. Christman is senior vice-president, European sales and marketing; Ronald A. Rosen succeeds Christman as vice-president, North American retail enterprises. John Borden continues as executive vice-

president of marketing for Case.

John C. Schulz is vice-president, construction equipment engineering. Earlier, R. Craig Breeze was named director of international marketing, non-Europe.

Briefly...

Gehl Co. has acquired certain assets of Keith Industries, Winnipeg, Man., including Straw Storm and Chaff Storm, which are crop residue distribution attachments for combines.

Something different. Morris Rod-Weeder Co., Yorkton, Sask., has rescinded layoff notices to over 50 workers and

20 others have been called back. Work at the Yorkton plant will continue without interruption. Spring sales exceeded expectations, said Adeleine Morris, president, and the changes are necessary to meet sales demands.

Imports of farm equipment to the U.S. in the first quarter of 1986 were \$448 million, up from 1985 by 6.5 per cent. For the first time, imports exceeded exports for a three-month period. Exports were \$407 million, down 5 per cent. Main sources of increased imports: Japan (up 37 per cent to \$132 million), West Germany (up 37 per cent to \$78 million), France (up 30 per cent to \$23 million).

Inventory Watch

What's happening to stockpiles in relation to sales.

Equipment	Inventory Levels							12-Month Sales
	Apr. 30 1985	Nov. 30 1985	Dec. 31 1985	Jan. 31 1986	Feb. 28 1986	Mar. 31 1986	Apr. 30 1986	May 1, 1986 Apr. 30, 1986
Tractors:								
Under 40 hp	45,349	44,086	46,559	51,537	56,446	58,306	55,947	60,151
40-99 hp	31,195	26,464	25,658	25,480	25,929	27,136	27,457	35,451
Over 100 hp	26,279	22,861	22,243	21,204	20,918	20,509	19,510	15,616
Four-wheel drive	4,585	3,400	2,889	2,719	2,623	2,612	2,537	2,703
Total Tractors	107,408	96,811	97,349	100,940	105,916	108,563	105,451	113,921
S-P Combines	9,813	7,249	6,685	6,373	6,342	6,744	7,054	8,137

Source: Farm & Industrial Equipment Institute



Implement & Tractor

The business magazine of the farm and industrial equipment industry

AUGUST 1986

Hydraulic Contaminants — Part I page 12

PLANTERS, DRILLS: WHERE ARE WE HEADED?

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Alternate Product Lines:
Commercial Mowers
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page 10

- 10: Parts Delivery — Be Sure Before You Try It.** Don Munson tried it — then dropped it. He still takes care of faraway parts customers, but differently.
- 12: Filter Ratings Tell a Story.** The first of a series on developments in control of hydraulic contaminants. This segment deals with a scientifically-based rating system for hydraulic filters.
- 18: Planters and Drills: What are the Trends?** The push is on for more diversity, more options, different combinations of features — and to use less fertilizer and chemical with greater effectiveness.
- 24: White Farm Adds Compact Tractor Line.** Built by Iseki of Japan, the five new models range from 14 to 39 horsepower. Also added, a 185 pto horsepower model at the top of the 2WD line.
- 32: Commercial Mowers: A Good Fit With Current Business.** For dealers in the right location, and with the right attitude, there are expanding opportunities serving the people and machines that maintain manicured lawns. Another in our alternate product lines series.

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INTERTEC
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A Little Less Grim, But Sales Still Slim

The June retail sales flash report from the Farm & Industrial Equipment Institute showed tractors of 140 hp and

over gaining ground for the second straight month. But analysts caution that with overall volumes remaining low,

a few extra sales create large percentage jumps. It's not yet a real rally.

	Unit Retail Sales					
	June			January-June		
	1986	1985	Pct. Change	1986	1985	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	8,869	8,247	+ 7.5	35,593	32,537	+ 9.4
40-99 hp	4,032	5,773	-30.2	16,221	21,641	-25.0
100-139 hp	941	765	+23.0	3,237	4,759	-32.0
Over 140 hp	1,505	848	+77.5	6,035	5,800	+ 4.1
Total 2-wheel drive	15,347	15,633	- 1.8	61,086	64,737	- 5.6
4-wheel drive						
Under 200 hp	41	89	-53.9	290	486	-40.3
Over 200 hp	136	175	-22.3	665	917	-27.5
Total 4-wheel drive	177	264	-33.0	955	1,403	-31.9
Total All Tractors	15,524	15,897	- 2.3	62,041	66,140	- 6.2
S-P Combines	462	477	- 3.1	1,763	2,386	-26.1
Balers (under 200-lb. bales)	1,189	1,440	-17.4	2,595	3,752	-30.8
Forage Harvesters (shear-bar type)	283	276	+ 2.5	642	897	-28.4
Mower-Conditioners	2,723	2,336	+16.6	5,499	6,258	-12.1

Briggs & Stratton, Kohler Reach Agreement

Briggs & Stratton and Kohler have reached agreement on the settlement of the anti-trust lawsuit brought last year by Kohler against Briggs & Stratton concerning after-market distribution of air-cooled gasoline engines, parts and service.

Kohler has agreed to dismiss the suit and will receive no payment of damages. Briggs & Stratton has agreed that, for

the five-year term of the agreement, it will not require, demand, or coerce central distributors it shares with Kohler to drop the Kohler line of engines or to set up separate facilities for the Briggs & Stratton line of engines.

Corn Squeezin's, Spark Plugs on Ford Tractors

The state of Illinois is using nine Ford tractors powered 100 per cent by ethanol. Eight are being used to maintain roads

and highways, the ninth for field work by the U. of Illinois College of Agriculture.

Ford Tractor Operations said that the tractors are 4810 models (derived from the 4610). The 4810 is mass-produced in Brazil and the units delivered to Illinois were assembled at Romeo, Mich., using the 4610 chassis and ethanol engine components from Brazil.

Ford said there are no plans currently to introduce the ethanol units to the North American farm market.

GM and Deere Form Joint Venture

General Motors and Deere & Co. have signed a memorandum of understanding to form a joint venture to design, manufacture and distribute, diesel engines worldwide. The proposed corporation would be held equally by both parent companies. The agreement is subject to final negotiations and clearance by the federal antitrust authorities.

The joint venture will include the diesel engine operations of Deere & Co. and the Detroit Diesel Allison Div. of General Motors.

The new company is yet to be named and will be headquartered in the Detroit area. Senior management will be drawn from both GM and Deere. It is expected that the new firm will be in operation under its new name and management by January 1, 1987.

Deere Backs Off Plan To Buy Versatile

Deere & Co. has terminated its agreement to buy the farm equipment division of Versatile Corp., which had been announced in December, 1985.

Deere said its decision to terminate resulted from the delay and uncertainty created by the U.S. Dept. of Justice's decision that Versatile must seek another buyer as a precondition to government approval. Deere added that if Justice Dept. approval should be obtained "in a reasonable period of time," the company may reopen talks with Versatile.

Briefly...

J I Case (Australia) Pty. Ltd. has bought selected assets of International Harvester Australia and IH Credit Corp. and will consolidate the Australian distribution organization into its network. Case IH will have approximately 200 distribution outlets in Australia. This completes the acquisition by Tenneco Inc. of IH agricultural equipment assets around the world.

Rhino Products, Dallas, Tex., and Alamo Group, Inc., Seguin, Tex., have announced the acquisition of all Rhino stock by Alamo for an undisclosed price, effective June 26. Alamo now has four mower lines: Rhino, Terrain King, Mott and Triumph.

Water used for irrigation declined 14 per cent from 2.1 to 1.8 acre-feet per acre from 1974 to 1984, according to a

survey by the Bureau of the Census for the USDA.

Trend continues. As reported in the July Update, domestic carbon steel continues to be priced about equally with foreign mills' offerings, according to a continuing survey of members by the Steel Service Center Institute. The July report by SSCI indicates that 55 per cent of respondents find the American product the

same (plus or minus 5 per cent) in price as overseas units; 45 per cent say that the foreign product is running 6 to 10 per cent cheaper. Six months earlier, the survey produced a 13-87 per cent response.

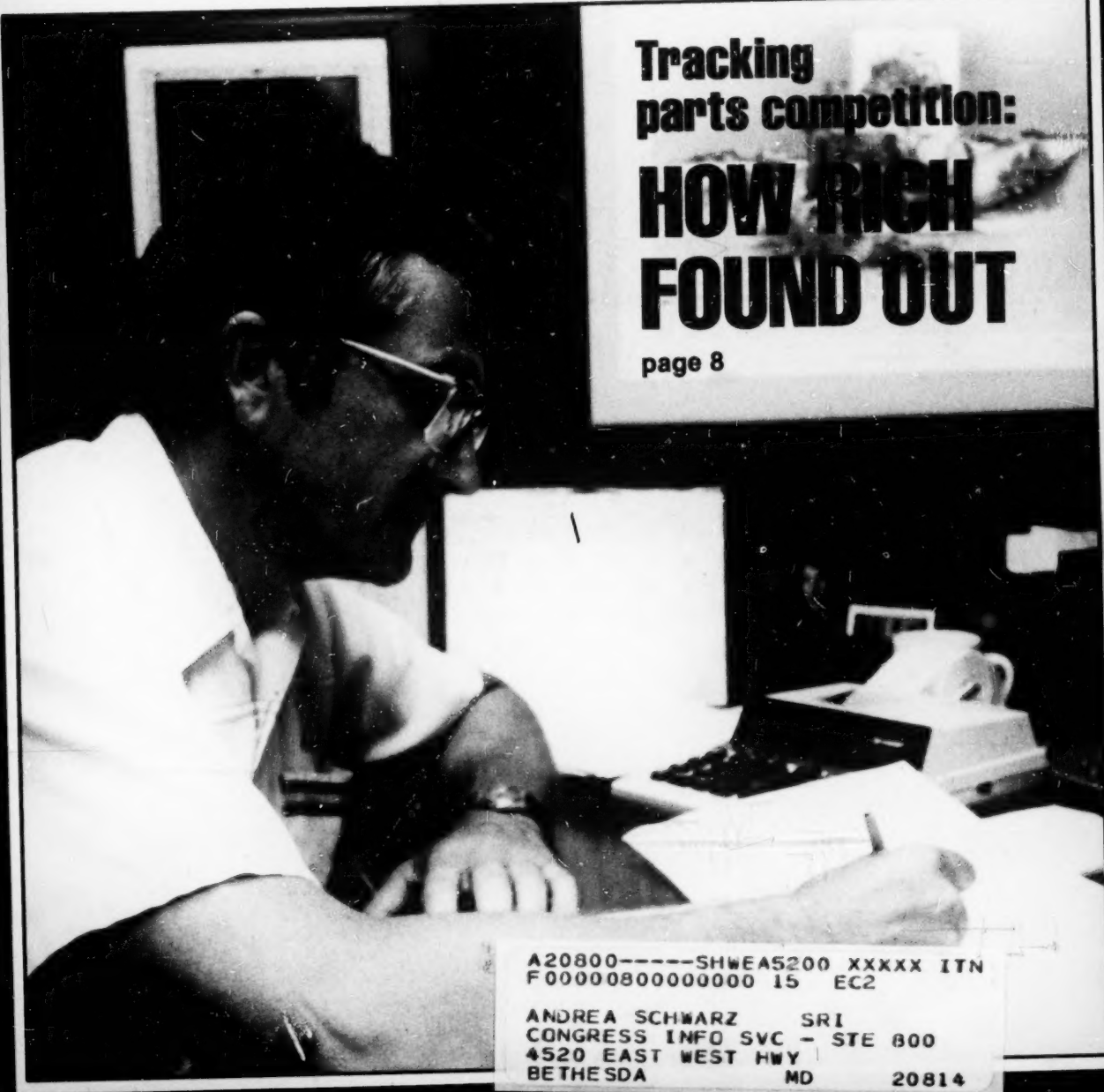
Intertec Publishing Corp. has sold *Agricultura de las Americas*, sister publication of I&T, to Keller International Publishing Co., Great Neck, N.Y.



The business magazine of the farm and industrial equipment industry

SEPTEMBER 1986

Dealers on Telemarketing page 22



Tracking parts competition:

HOW RICH FOUND OUT

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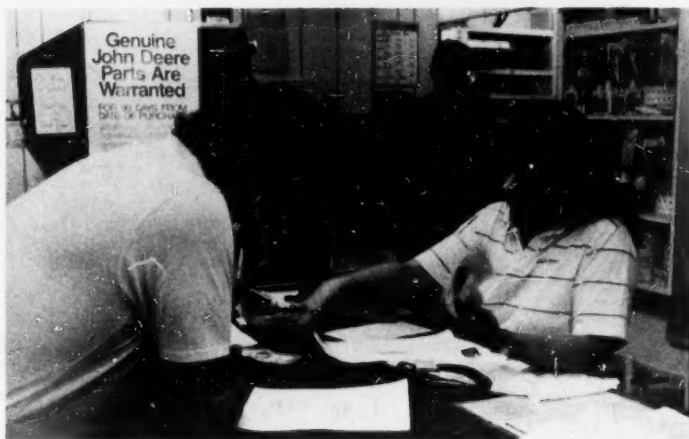
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Implement & Tractor

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- 8: Rich Streltmatter's Parts Survey.** Illinois dealer finds out where and why his equipment customers buy certain parts. Result: He now knows how to focus his parts marketing efforts—and sales are up!
- 12: Shops Did Better in 1985, but...** Average loss among service departments in the NFPEA Cost of Doing Business study was still \$52,000.
- 16: Today's Tillage: It's Revolutionary Evolution!** Seeking survival, today's farmers are adapting profit-enhancing ways of working the soil—without waiting for much in the way of proof.
- 22: Dealers' Verdict on Telemarketing: Generally Good.** I&T's For Dealers Only survey asked dealers to comment on their experiences or perceptions about this factory-to-dealership approach.
- 28: It's Not Easy Being Clean.** But it's sure important! Second in a series on the subject of hydraulic contaminants.
- 39: New Models from Case, Kubota.**

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June's Plus Signs Fade in July

While June's retail sales report from the Farm & Industrial Equipment Institute had shown increases in sales of two-wheel-drive tractors over

100 hp, as well as the usual good news in the under-40-hp market, July reversed those positive trends. Despite a pickup in four-wheel-drive

units in July, total tractor volume was down.

For the second consecutive month, sales of forage harvesters and mower-conditioners were up.

	Unit Retail Sales			Unit Retail Sales		
	July	Pct.	July	January-July	Pct.	January-July
	1986	1985	Change	1986	1985	Change
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	4,739	5,004	- 5.3	40,339	37,541	+ 7.5
40-99 hp	2,362	2,917	-19.0	18,566	24,558	-24.4
100-139 hp	177	491	-64.0	3,417	5,250	-34.9
Over 140 hp	304	671	-54.7	6,349	6,471	- 1.9
Total 2-wheel drive	7,582	9,083	-16.5	68,671	73,820	- 7.0
4-wheel drive						
Under 200 hp	59	41	+43.9	349	527	-33.8
Over 200 hp	126	105	+20.0	792	1,022	-22.5
Total 4-wheel drive	185	146	+26.7	1,141	1,549	-26.3
Total All Tractors	7,767	9,229	-15.8	69,812	75,369	- 7.4
S-P Combines	691	564	+22.5	2,456	2,950	-16.7
Balers (under 200-lb. bales)	1,106	1,259	-12.2	3,710	5,011	-26.0
Forage Harvesters (shear-bar type)	250	172	+45.3	892	1,069	-16.6
Mower-Conditioners	1,731	1,659	+ 4.3	7,231	7,917	- 8.7

Wholesalers Plan 'Tabletop' Product Review in Vegas

The Farm Equipment Wholesalers Assn. will sponsor a first-time "Product Review Showcase" Oct. 19 in conjunction with its annual convention at Bally's Grand Hotel, Las Vegas, Nev.

FEWA's convention is held concurrently with that of the Farm Equipment Mfrs. Assn. at the same facility.

According to Thomas Irwin, executive vice-president, booths are available for manufacturers and vendors of products of interest to short-line wholesalers and manufacturers.

FEWA is headquartered at Box 1347, Iowa City, Ia. 52240, telephone 319/354-5156.

Briefly...

Melroe Co., Fargo, N.D., will

import Komatsu mini-excavators for sale in the U.S. under the Bobcat trademark through existing Melroe outlets.

Hiniker Co., Mankato, Minn., has acquired the trademarks, patents and finished inventory of Fox Brady, Appleton, Wis.

The Agricultural Driveline Mfrs. Assn. has named Joel Martin (Walterscheid) as its president with Bennett Reak (Weasler Engineering) as vice-

Exports Down, Imports Up, In First Half of 1986

U.S. farm equipment exports in the first half of 1986 were down 15 per cent at \$836 million and imports went up by 6 per cent to \$877 million, compared with the first six months of 1985.

Exports: Major market declines included Mexico (down 63 per cent to \$47 million), Canada (down 7 per cent to \$396 million), Saudi Arabia (down 55 per cent to \$24 million) and Australia (down 61 per cent to \$27 million).

Improved major markets included West Germany (up 50 per cent to \$38 million), Venezuela (up 170 per cent to \$29 million), Britain (up 13 per cent to \$34 million) and France (up 35 per cent to \$44 million).

Imports: Major increases came from West Germany (up 16 per cent to \$137 million), Britain (up 18 per cent to \$129 million), France (up 19 per cent to \$43 million) and Japan (up 30 per cent to \$233 million).

Principal declines came from Canada (down 22 per cent to \$178 million), Italy (down 12 per cent to \$63 million) and the Netherlands (down 20 per cent to \$15 million).

president and Gerald J. Brooks (Rockwell International) as treasurer.

Headquartered at 3 First National Plaza, No. 5200, Chicago, Ill. 60602, ADMA is a trade group formed "to promote safety in the design, construction and use of driveline components used in the farming industry."

Inventory Watch

What's happening to stockpiles in relation to sales.

Equipment	Inventory Levels							12-Month Sales, July 1, 1985 Jun. 30, 1986
	June 30, 1985	Jan. 31, 1986	Feb. 28, 1986	Mar. 31, 1986	April 30, 1986	May 31, 1986	June 30, 1986	
Tractors								
Under 40 hp	37,814	51,537	56,446	58,306	55,947	54,041	52,089	60,266
40-99 hp	28,024	25,480	25,929	27,136	27,457	27,319	25,751	32,400
100 hp and over	25,219	21,204	20,918	20,509	19,510	18,400	16,247	16,435
Four-wheel drive	4,185	2,719	2,623	2,612	2,537	2,514	2,513	2,467
Total Tractors	95,242	100,940	105,916	108,563	105,451	102,274	96,600	111,568
S-P Combines	10,299	6,373	6,342	6,744	7,054	7,253	7,323	7,781

Source: Farm & Industrial Equipment Institute

Today's Tillage: It's Revolutionary Evolution!

Farmers, fighting to survive and looking for profit-boosting approaches, are more inclined than ever to try new tillage ideas. But successful moves to new tillage systems require the best in the way of farmer management skills. First of two articles.

By Frank Buckingham



How Far We've Come

(millions of acres worked)

Crop	Year	No-Till	Minimum Till	Conventional Tillage
Corn	1972	2.069	10.591	58.841
	1979	3.823	22.500	53.734
	1986E	6.472	25.866	46.631
Soybeans	1972	.867	5.073	37.920
	1979	2.202	14.925	47.874
	1986E	4.321	17.828	40.191
Small Grains	1974	.222	15.400	67.468
	1979	.763	24.511	67.282
	1986E	3.204	30.680	54.597

Source: 1985-86 Tillage Practices survey by No-Till Farmer newsletter, Box 624, Brookfield, WI 53008, telephone 414/782-0604.

■COUNTLESS people in the last two decades have predicted that the moldboard plow would soon pass into oblivion. Far from it. The moldboard plow remains the most widely used primary tillage tool in the country.

Its use has declined dramatically in recent years, and unit plow sales have dropped. But, some tillage experts believe *total plowing capacity on farms* remains near the all-time high, even though some plow bottoms may be getting a bit rusty. They say the average cutting width of plows sold today is probably two or three times bigger than the typical ones from the glory days of plow sales, so plowing *capacity* has remained more or less constant.

Though most current tillage implements and practices evolved from earlier machines and techniques, their current rate of adoption by farmers is almost revolutionary compared to past changes. In fact, few industries can match American agriculture's change-a-minute pace: the fluctuations in commodity prices, announcements of new farming methods, techniques, equipment, pesticides and other inputs, plus the endless frustrations of simultaneously dealing with equally unpredictable weather and government bureaucracies.

Because they're fighting for economic survival, and agricultural

(More...)

Today's Tillage

(continued)

research budgets have shrunk in recent years, many farmers no longer wait until new ideas have been fully studied and proven experimentally before adapting, on their own farms, any of them that might improve their profitability. If equipment to implement a new practice is unavailable, they simply modify and adapt existing machines, or design and build their own.

Today's farmers are as concerned about soil erosion and environmental pollution as anyone—more than many people give them credit for. But the primary driving force behind this tillage revolution is hard-nosed economics, and anyone in the equipment business who ignores that fact does so at his own peril. Emotional appeals for soil and water conservation may be heard, and ignored, unless pleas are backed by hard evidence that such efforts will also increase net farm income. Farmers are looking for or developing their own methods and equipment to save fuel, time, soil, water and most of all, money. Any

operations that cannot pay for themselves in higher yields, or provide other identifiable economic benefits, are being eliminated.

You've got to have a system

Because various tillage tools individually or in different combinations can be operated to produce widely differing results, the goal established for a tillage system is more important than implements chosen for that system. For example, conservation tillage is defined as any system that leaves at least 30 per cent of the soil covered by residue from the previous crop after the new crop is planted—regardless of equipment used. Thus defined, conservation tillage is a better-understood term than reduced tillage or minimum tillage.

Most conservation tillage systems include a chisel plow or disk harrow for primary tillage, and secondary tillage (if any) by field cultivators or disk harrows—so long as 30 per cent of the soil remains covered by crop residue. But, as defined, conservation tillage includes no-till, slot-planting, strip-till, ridge-till and other tillage/planting methods that leave the required amount of residue cover. (Early attempts to define conservation tillage included pounds of various crop residues to be retained on the soil surface. However, precise quantities of remaining residue are difficult to measure or estimate, whereas the per cent of soil coverage is more easily determined.)

Where do we stand?

The National Conservation Tillage Information Center (CTIC), Fort Wayne, Ind., reports that approximately one-third of crop acres nationwide are now planted with conservation tillage practices. They also say that more than 12 million acres of Iowa cropland (more acres than any other state, but seventh in percentage of cropland), including nearly half the state's corn and soybean acreage, was planted with conservation tillage in 1985. That's a 20 per cent increase from 1984 and

1983. But, 77 per cent of Delaware's cropland is planted with conservation tillage, the highest percentage in the country.

According to the 1985-1986 *Tillage Practices Survey* by *No-Till Farmer* magazine, more than 19 million U.S. crop acres were no-till planted in 1986, a 6.9 per cent increase. This includes about 1.1 million acres of forage and pasture, small grain on 3.2 million acres, 4.3 million soybean acres, corn on 6.5 million acres, plus lesser amounts of cotton, vegetables and other crops.

The report adds, "The minimum tillage acreage is expected to actually drop by 1.4 per cent (to 85.6 million acres from 86.9 million acres in 1985)—the first time this has happened in many years." But the survey predicted that combined no-till and minimum-till acreage would be about the same for 1985 and 1986.

Illinois growers planned to no-till almost 1.9 million acres in 1986, and five other states expected to top the million-acre no-till level: Kentucky, Ohio, Missouri, Indiana and North Carolina. (The full state-by-state, crop-by-crop survey report on no-till, minimum till and conventional tillage acres is available for \$100 from *No-Till Farmer*, Box 624, Brookfield, WI 53008.)

A CTIC survey indicated that ridge-till acreage jumped 45 per cent from 1984 to 1985, and *No-Till Farmer* projected a 20.3 per cent increase in ridge-till for 1986. Leading ridge-till states are Nebraska, Minnesota, Iowa and Illinois.

For years, the Buffalo till-planter from Fleischer Mfg. was the ridge-till equipment market. But, farmers wanting to ridge-till adapted and built equipment, until, in a customer-driven move, other manufacturers entered the market with planter adaptations, guidance systems, cultivators and other tools.

How can they afford it?

Farmers are pushing sharp pencils these days and many find they can't afford not to change. Some who

(Continued on page 40)

Ridge Tillage, 1986

Crop	Acres Worked
Corn	1,589,148
Soybeans	663,516
Double-Cropped Beans	4,655
Grain Sorghum	97,132
Small Vegetables	8,570
Grains	10,464

Source: 1985-86 Tillage Practices survey by *No-Till Farmer* newsletter, Box 624, Brookfield, WI 53008, telephone 414/782-0604.

Telemarketing Verdict: Generally Good

By Scott Nesblitt

■TELEMARKETING between dealers and their manufacturers seems fairly well accepted, but dealers see some need for fine-tuning and occasional contact by a living human being, at least now and then.

"Better information in shorter wait time. Less time wasted...but I miss the local news," commented a Massey-Ferguson dealer who was among 23 dealers who were on telemarketing when the survey appeared in the May, 1986 I&T.

"Don't like it. You gain more by personal contact at least once in a while," wrote a White dealer who's on the system.

A dealer who doesn't have telemarketing didn't pull his punches: "If we must go on telemarketing, we would cancel. We can't transact business with *our* retail customers on the telephone."

"The day it is mandated, I quit!" wrote another dealer in the group of 10 respondents not on telemarketing.

Generally, the dealers on telemarketing tended to support it, as evidenced by their responses to the statement "If direct contact is adopted, want to keep telemarketing also." Seven strongly agreed, 11 agreed, and four others were neutral, disagreed or strongly disagreed.

Eleven also agreed, and three strongly agreed, with the statement, "Telemarketing representatives usually have sufficient training, access to information." Three were neutral to that, four disagreed, and none strongly disagreed.

For those who like such things, there's a box score with this story showing how the dealers responded to other statements included in the survey.

Dealing with reps

The dealers who have telemarketing had mixed feelings about the value of actual people visiting the dealership on behalf of the factory. Generally, they like the phone service because it put them in touch with factory people who had facts at hand.

"I am undecided about telemarketing, but fellows on the phone seem to know their business," said a Massey Combines Corp. dealer.

Another dealer praised the "up-to-date service information; better idea on current programs and promos," but another said, "You can always find the telemarket person, but it can be harder to fix service problems."

If some dealers don't particularly like their telephone rep, they apparently won't have to worry much about a personal visit anyway. Twelve of the 23 said they never or

very seldom see the rep in person, while another six said there was a visit once a year. Three saw their rep once a month, one saw his every six months. And one dealer saw his rep bi-weekly.

Nor do the phones from the factory ring all that much. Seven dealers receive weekly calls, eight get monthly calls, and the others fell into time periods that translate to very seldom or you-never-know.

Three of the dealers seem to be real talkers, with the average telemarket call lasting 10 to 20 minutes. For the others, it was under 10 minutes of phone time.

Lengthy thoughts

One dealer took the trouble to send I&T a three-page letter about the subject, and using the same letter to take shots at some manufacturers' policies, which he sees as punishing dealers who pay cash rather than extending their goods on seemingly perpetual terms and "renew one unit, if you put an extra one in stock" programs.

That dealer would like to see his factory telemarketers work when he does—on weekends.

"The disadvantage is that on Saturdays, Sundays and holidays, we no longer have anyone we can call to locate inventory," he wrote.

"Unfortunately, I would guess 30 to 40 per cent of the new sales are going to weekend farmers with a full time job in town.

"I have had them (the factory) take up to seven or eight days to locate a piece of equipment. When you have somebody ready to buy, that is too much time!"

The advantage he saw was that during working hours, he can usually get someone at the factory to find inventory he needs.

Another dealer summed up his feelings, which seem to match the motives factories have for converting to telemarketing in the first place:

"Contact more people in shorter time; cost efficient; save customers' time and money. Opens doors for wholegoods sales." □



Dealers React to Telemarketing Statements

(I&T asked dealers in our May issue to indicate how they felt about these statements. Numbers indicate individual dealer answers.)

	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Telemarketing has helped my business	7	3	6	3	4
Prefer telemarketing to traditional methods of contact	1	8	4	5	5
Will go to direct contact, drop telemarketing if offered	4	6	4	7	1
If direct contact is adopted, want to keep telemarketing also	7	11	1	2	1
Telemarketing is good, but I'd benefit from more personal contact	6	7	5	3	1
Telemarketing representatives usually have sufficient training, access to information	3	11	3	4	0

Auction Prices

Asterisk beside price indicates highest bid offered on tractors that were not sold.

YODER & FREY, INC. Archbold, Ohio July 8, 1986

MASSEY-FERGUSON TRACTORS

165, 1972 (Rough)	1650
165 diesel, 1970 (Rough)	3400
35, 1960 (Rough)	1700*
35, 1958 (Good)	1900
35, 1959 (Rough)	1500*
35 diesel, 1961 (Fair)	2000*
65, 1964 (Rough)	1525
255 diesel, 1976 (Fair)	5350*
2775 diesel, 1981 (Good)	8250*

DEUTZ TRACTORS

D6006 diesel, (Fair)	3100
D6206 diesel, (Fair)	3100*

INTERNATIONAL HARVESTER TRACTORS

H, 1951 (Fair)	575*
H, 1950 (Fair)	385
H, ldr., 1947 (Rough)	625
M, ldr., 1952 (Rough)	500
M, 1949 (Fair)	900
Sup. C, 1952 (Fair)	700

200, 1956 (Rough)	650
230, 1958 (Fair)	800
300, 1957 (Fair)	750*
300, ldr.	1500
350 diesel, 1958 (Fair)	925*
460 diesel, 1961 (Fair)	1250*
560, 1959 (Good)	1700
560, 1961 (Fair)	1400*
574 diesel, 1975 (Good)	3750*
656 Hydro diesel, 1970 (Fair)	2600*
656, 1969 (Fair)	2000
674 diesel, 1975 (Good)	3900*
856 diesel, 1969 (Rough)	3500
966 diesel, 1977 (Good)	6500*
1206 diesel, 1964 (Fair)	2300*
4586 diesel, duals, 1978 (Good)	13,000*

JOHN DEERE TRACTORS

46, (Rough)	310
46, (Fair)	550*
60, 1954 (Rough)	650*
70, (Rough)	400*
520, ldr., 1957 (Fair)	1200
520, 1956 (Rough)	775
620, 1957 (Rough)	950
2010 diesel, 1962 (Rough)	1525
2510, 1964 (Fair)	2575

3010 diesel, 1962 (Fair)	1500
3010 diesel, 1963 (Good)	3200*
3020 diesel, 1971 (Good)	5500*
4430 diesel, 1975 (Fair)	7300
4630 diesel, 1975 (Good)	9250*

OLIVER TRACTORS

88, 1953 (Fair)	850
55, ldr., 1956 (Fair)	1600*
1250, 1970 (Rough)	1200*
1555 diesel, ldr., 1972 (Rough)	2000
160J diesel, 1964 (Fair)	1700*
1350 diesel, 1967 (Rough)	2500*

WHITE TRACTOR

2-155 diesel, 1978 (Good)	9000*
---------------------------	-------

FORD TRACTORS

8N, 1948 (Fair)	1050*
8N, 1949 (Rough)	800*
8N, 2xpl., 1948 (Good)	1850
9N, 1942 (Fair)	1200
NAA, 1953 (Fair)	1400*
601 Select-O-Speed, 1956 (Fair)	1850
641, ldr., 1955 (Fair)	2250
860, 1957 (Fair)	2250

CASE TRACTORS

430, ldr.	1650
930, 1965 (Fair)	1800*
930 LP, 1967 (Rough)	875*
1030 diesel, 1964 (Fair)	2500*
1370 diesel, 1976 (Good)	7600
1370 diesel, 1975 (Fair)	4000
2090 diesel, 1980 (Good)	7250*
2670 diesel, 1975 (Rough)	6250*

DAVID BROWN TRACTOR

990 diesel, 1975 (Fair)	2800*
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MASSEY-HARRIS TRACTOR

22, 1945 (Fair)	400*
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STEIGER TRACTOR

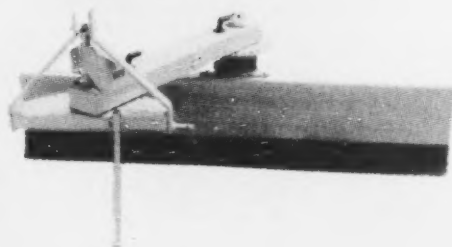
Panther II diesel, 1982 (Rough)	11,000*
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ALLIS-CHALMERS TRACTORS

WD-45, 1953 (Rough)	275
WD-45, 1955 (Fair)	550
WD-45, 1955 (Fair)	875*
170 diesel, ldr., 1969 (Rough)	3200*
190XT diesel, duals, 1967 (Rough)	2600*
200 diesel, 1972 (Fair)	3160
200 diesel, 1972 (Fair)	2900*

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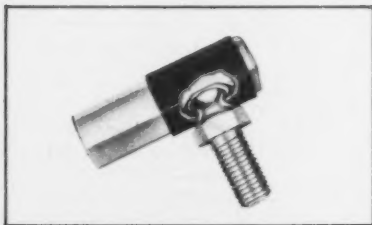
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Write in (30) on Reply Card

Today's Tillage

(Continued from page 18)

switched from conventional tillage to ridge-till have cut equipment inventories by 20 to 50 per cent, cut fuel per acre by half, reduced labor prior to harvest by one-half or more, and in many cases, held chemical costs constant or even reduced them.

Here's an example: Fertility level of Joe Farmer's cropland and is moderate to high when he decides to ridge-till. He has all soil tested and, in the last season he uses conventional tillage, plows under recommended maximum amounts of phosphorous and potash. His last conventional crop is planted in the row widths and field patterns he will use for ridges.

At lay-by time, a new ridge building cultivator rolls soil into crop rows to build ridges for next year's planting. Since Joe will ridge all his row crops, he now sells his 4-wheel-drive tractor, moldboard plow, his field cultivator and/or disk harrow.

If he has a sturdy late-model planter, he needs to add ridge-top cleaners to provide a clear path for planter openers. These also divert weed seeds into furrow middles and remove residue so that ridge tops warm quicker for fast germination. Banding herbicide on the rows cuts chemical cost and cultivation removes weeds between rows. Ridges are rebuilt with a second pass. Spot spraying gets weeds not controlled by cultivation or banded herbicide. Starter fertilizer, plus more knifed into soil next to ridges, meets crop needs.

Ridge-till is a form of controlled traffic, where all wheel traffic uses the same paths year after year. This may even require adjustment of combine wheels to match ridge spacing, but it can be worthwhile as some tests show significant yield reductions when combine wheels operate on ridges—whether soil is wet or dry. Random wheel traffic may be partly responsible for increases in soil compaction following a few years of no-till planting without ridges. It's been shown that different sized wheels with equal loads per square inch cause equal compaction in the upper 12 inches of soil. But, axle loads over 5 tons can cause subsoil compaction that isn't relieved by several years of

freezing and thawing even without additional heavy loads.

It takes management

Careful planning and attention to management details are required for any successful switch between tillage systems. Example: Paraquat or other burnback herbicide is normally used at no-till planting time. Instead, some farmers apply split applications of pre-emergence herbicides with the first dose four to six weeks before planting and the next at planting time. This often reduces herbicide cost, may provide better control of some weeds, cuts moisture loss to early weed growth and reduces danger of crop damage by herbicides. However, some growers have found that in dry seasons, early weed kill caused the soil surface to dry and bake more than if covered by vegetation.

Agricultural engineers and crop specialists therefore urge farmers to adapt tillage management techniques to specific fields, or even parts of fields, for maximum net return. This includes contouring, strip cropping, terracing and other appropriate erosion control measures, adjusting fertilizer rates to the productive potential of various slopes and field areas, increasing soil organic matter, which generally comes with any form of conservation tillage, and minimizing harmful soil compaction. □

Industry Changes

Arthur C. Fultz, Jr., has been appointed sales manager of **Ingersoll Products Corp.**, Chicago, Ill., manufacturer of agricultural disk blades.

Eric A. Haas has been named sales manager by **Bush Hog Farm Implements Div.**, Selma, Ala., according to Robert O. Moore, vice-president, sales. Previously, Haas was national sales manager for Wil-Rich, Inc.

Toyota Industrial Engine Operations, launched early this year by **Toyota Motor Sales, U.S.A.**, has established an office at 2345 S. Lynhurst Drive, Suite 112, Indianapolis, Ind., telephone: 317-241-7875.

Tom Phillips has been appointed regional sales manager for the Turf Equipment Div. of **Middleworth Engineering & Mfg., Inc.**, Greentown, Ind.

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Implement & Tractor

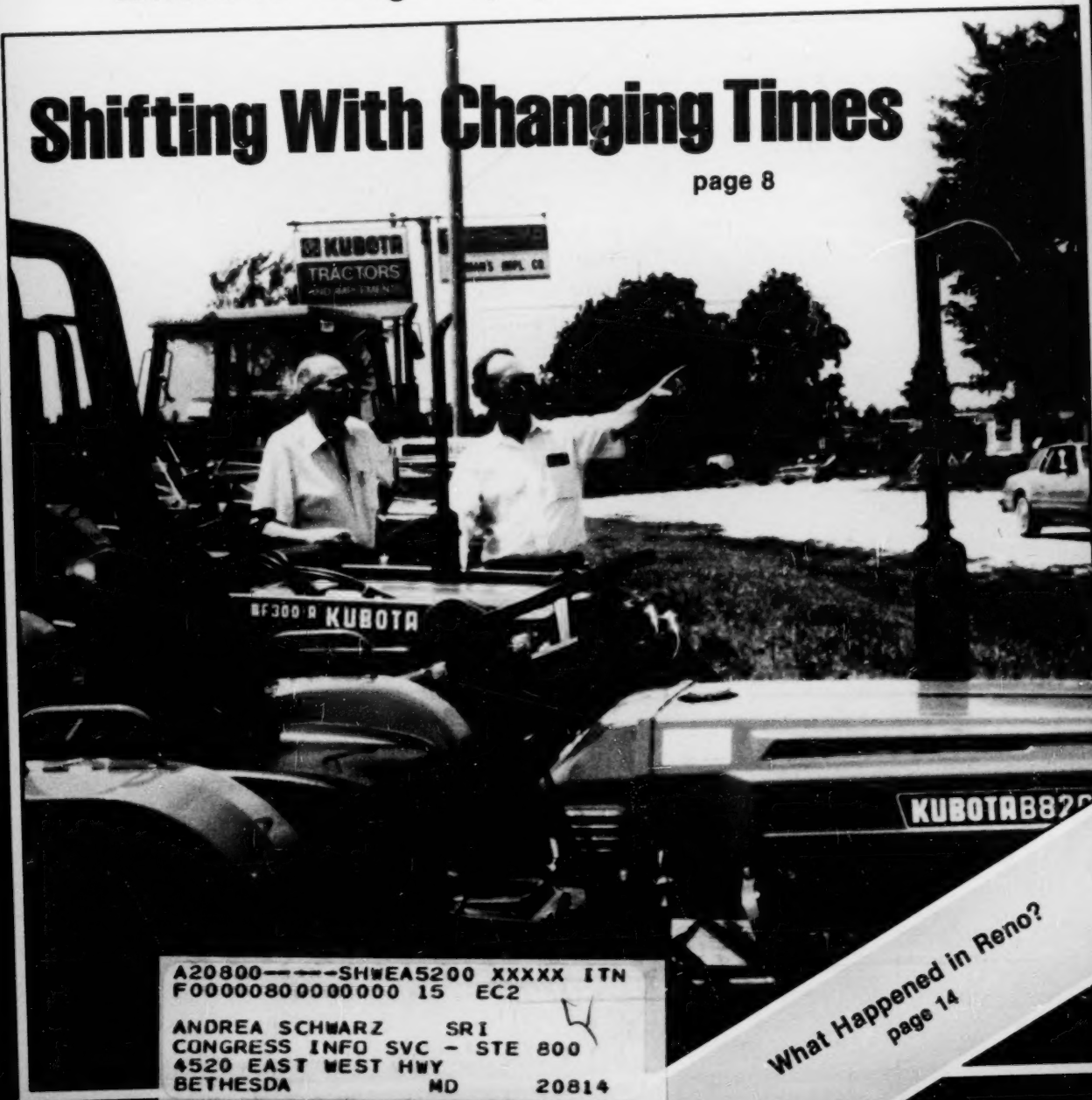
The business magazine of the farm and industrial equipment industry

OCTOBER 1986

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What Happened in Reno?
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IMPLEMENT & TRACTOR

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October 1986 • Vol. 101 • No. 12



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8: Times Change — Be Ready to Shift Sales Emphasis. When both ag and industrial equipment sales weakened, the L. E. German Implement Co. carved a niche for themselves in the small tractor market. Read how they found it and developed it.

14: NFPEDA in Reno: Dealers Pick Bingham, Streacker, Wilson. Norman Bingham, Casa Grande, Ariz., is the new president; Earl Streacker, Findlay, Ohio, is first vice-president, and Jay A. Wilson, Spartanburg, S.C., is second vice-president. Meeting highlights included: three changes in the bylaws and a panel of FIEI officers discussed many industry concerns.

24: Tillage Equipment: Lots of Room Left for Problem Solvers. As farmers move toward new systems to meet their particular economic, soil and cropping needs, there are plenty of new opportunities for manufacturers, but it takes flexibility.

On the cover...L. E. German and son Chuck with part of the small tractor lines that have helped the dealership adjust to changes.

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October 1986 **Implement & Tractor** 3

Hurray for Combines! August Volume Shows Strong Rise, But Tractors Slip

"One month doesn't make a trend," said a marketer commenting on the August combine surge, "but we're encouraged. At the end of the year, you'll probably see North American combine sales about

where they were last year, and after all those declines, it doesn't seem bad."

Not only are the new combine sales up, used combine inventories on dealers' lots are reportedly well under control,

even low in many cases. With new combine inventories in better balance than in recent years, 1987 will probably see less intense discounting, note market observers.

	Unit Retail Sales					
	August		Pct. Change	January-August		Pct. Change
	1986	1985		1986	1985	
Farm Wheel Tractors:						
2-wheel drive						
Under 40 hp	4,340	4,243	+ 2.3	44,786	41,784	+ 7.2
40-99 hp	2,161	2,367	- 8.7	20,704	26,925	-23.1
100-139 hp	202	333	-39.3	3,605	5,583	-35.4
Over 140 hp	279	641	-56.5	6,610	7,112	- 7.1
Total 2-wheel drive	6,982	7,584	- 7.9	75,705	81,404	- 7.0
4-wheel drive						
Under 200 hp	13	43	-69.8	362	570	-36.5
Over 200 hp	54	133	-59.4	843	1,155	-27.0
Total 4-wheel drive	67	176	-61.9	1,205	1,725	-30.1
Total All Tractors	7,049	7,760	- 9.2	76,910	83,129	- 7.5
S-P Combines	1,656	865	+91.4	4,195	3,815	+10.0
Balers (under 200-lb. bales)	745	734	+ 1.5	4,466	5,745	-22.3
Forage Harvesters (shear-bar type)	210	257	-18.3	1,114	1,326	-16.0
Mower-Conditioners	1,096	988	+10.9	8,236	8,905	- 7.5

Tenneco Bids for Steiger Tractor Shares at \$3.50

Tenneco, Inc., owner of Case-IH, launched a tender offer in late September for Steiger Tractor, Inc., Fargo, N.D., maker of four-wheel-drive tractors. The offer is \$3.50 for each of Steiger's 4.4 million

shares, or \$15.4 million.

In June, Steiger began operating under bankruptcy law protection and listed \$47.5 million in debts.

The transaction, approved by both companies' boards and by 35 per cent of Steiger stockholders (including Deutz, holder of about 25 per cent), requires approval by the Federal

government and Steiger holders, and receipt of tenders for at least two-thirds of Steiger's shares.

Manufacturing and engineering of four-wheel-drive tractors will remain at Fargo, according to a Case-IH spokesman. Steiger operations will be consolidated with those of Case-IH.

Deere's Bartlett Will Retire as of March 31, 1987

Boyd C. Bartlett, president and chief operating officer of Deere & Co., plans to retire Mar. 31, 1987. Bartlett's decision to retire, the company said, "is in keeping with his long-standing plans to pursue personal interests."

Bartlett, 60, joined Deere in 1952. Among the positions he has held: sales manager and later general manager of the Lansing, Mich., branch; director of marketing services; director of sales branches; vice-president, farm equipment and consumer products marketing;

and senior vice-president of that division. A member of the board since 1979, he became president in 1985.

Varity (Massey) Nets \$15 Million In First Half

Varity (Massey-Ferguson Ltd.) has reported net earnings of \$15 million for the first six months and \$9.1 million for the second period of fiscal 1986, compared with losses of \$5.5 million and \$5.9 million in the same segments of 1985. Results for 1985 have been reclassified to reflect the restructuring involved when 55

per cent of the combine business was sold.

Total sales were \$709.6 million for the first half and \$363.4 million for the second quarter of 1986, compared with \$604 million and \$335.8 million in 1985. In North America, volume for the first six months rose from 1985's \$133 million to \$152 million; for the second quarter, it went up from \$69.3 million to \$82.3 million.

Briefly...

Donald E. Jacoby, marketing vice-president of Northrup King Co., Golden Valley,

Deere 9-month Sales Off 7 Pct. To \$2.7 Billion

Deere & Co. had sales of \$2.7 billion in the first nine months of fiscal 1986 (ended July 31), a 7 per cent decline from the \$2.9 billion of 1985. The company had a nine-month net loss of \$107 million, compared with net earnings of \$11 million in the first three quarters of 1985.

In the third quarter, the loss was \$40 million on sales of \$973 million, compared with net income of \$4.5 million on sales of \$1.02 billion in 1985's third period.

Becherer Named. Deere's board has named Hans W. Becherer executive vice-president responsible for worldwide farm equipment and consumer products operations. It is a newly created position. He had been vice-president, overseas division, farm equipment and consumer products, since 1983.

Minn., and former marketing executive for International Harvester and later J I Case Co., has been elected chairman of the Agriculture Council of America.

Hiniker Co., Mankato, Minn., has acquired the Fox/Brady product lines from Piper Industries, Appleton, Wis. The Fox/Brady brand name will continue, with all sales, production and related activities moving to Mankato. The line includes forage harvesters, stalk shredders, choppers and windrowers, and highway sand and salt spreaders.

I&T has learned of the death in August of Don O. Carl, retired director of sales branches at Deere & Co. Among positions he held in a 30-year career with Deere were manager of the Syracuse, N.Y., branch and director of marketing for consumer products.

National Assn. of Service Managers has launched a national employment referral program to provide a link between employers and service people seeking new positions. Details are available at NASM, 60 Revere Dr., Suite 500, Northbrook, Ill. 60062, telephone 312-480-9575.



How is the French dealer making it?

Dear Editor:

You asked me to get together a profile of the French farm equipment dealer. This is it, and I think you'll agree that this profile shows he has a pronounced resemblance to his American cousin. Either that, or business is business and farmers are tough customers wherever you go.

First, you should understand that the French agricultural economy has gone through the same basic difficulties as the American, though not as severely. French farmers' net income in 1985, for instance, was down 7 per cent from 1984.

In 1984, there were 1,750 franchised farm equipment dealers, compared with 2,000 five years earlier, and between them they sold 54,200 tractors. That works out to 30 tractors each, which may sound good to most American tractor dealers. However, 1985 data show that French domestic tractor sales were down to 47,500 units, and by way of comparison with better times, sales in 1976 were 74,560 units.

In 1986's first half, sales of tractors are down by 17 per cent to 17,017 units. Estimates are that the full year's sales may not exceed 40,000 units.

The trend with self-propelled grain combines is similar. Unit sales that were 4,773 in 1981 were down to 3,880 in 1984.

The average French dealer had total sales in 1984 of about \$2.6 million. Here's how it divided:

Department	Per Cent
New equipment	58.0
Used equipment	16.0
Parts	16.5
Service	4.8
Miscellaneous and billings to other dealers	4.7

Typically, the French dealer employs 14 to 20 persons, thus:

Department	No. of Persons
Service	8-10
Sales	2-4
Parts	2
Administration	3

It works out to sales volume of about \$130,000 per employee, with

salesmen producing an average volume of \$630,000. Service personnel produce about \$15,000.

Total gross margin was 23.2 per cent (compared with 25.5 per cent two years earlier), and net profit before tax was 1.2 per cent (compared with 1.5 per cent two years earlier). The tax is 50 per cent of the profit, so the post-tax net was 0.6 per cent or about \$15,000.

Service operations

French dealerships appear to experience considerable loss in their service departments. As noted, service personnel comprise 52 per cent of the personnel and 5 per cent of the sales volume. The shop labor rate—the amount that the dealer can charge the customer for repair services—has been a matter of governmental control and as of the end of August was running at about \$14 an hour.

However, as of Sept. 1, controls were removed. Dealers are free to charge as they wish, but it is expected that it won't change much. Competition will hold it at about \$15 to \$16.

The hours of service labor for which the dealer pays break down this way:

Activity	Pct. of Hours
Service work billed to outside customers	29
New equipment preparation and delivery	12
Warranty work	8
Used equipment reconditioning	18
Internal work (vehicles, etc.)	10
Vacations	13
Non-productive hours	10

Coping with change

Facing the declines of the French farm equipment industry, most dealers have tried to move into other businesses. One of the most common approaches has been to enter a discount chain, such as Sumagri,



One of the chain outlets that worry some dealers but which other dealers have joined. Products displayed include plows, a baler, and up close, a tank spreader.



Mat-Service, or Promodis, or a semi-franchised chain such as Espace-Emeraude, Vivre a la Campagne or Ami Rural.

One of the most successful of these chains is Espace-Emeraude, which includes 35 dealers in its 100 points of sale. The typical store in this chain is a 600-sq.-meter building for the cash-and-carry shop plus about 2,500 sq. meters outside for the display of items such as trailers and plows. The typical outlet does about \$640,000 in volume with three employees.

The items that generate the most volume are common wearable parts, tractor accessories, tires, oil, filters, batteries, and even clothes and boots (which can amount to as much as 8 per cent of sales volume).

These stores focus about one-third of their advertising directly to farmers; the other two-thirds is aimed more broadly at country people, i.e., residents of small towns, especially women.

Dealers who invest in a chain outlet like Espace-Emeraude tend to locate it a good distance from the main dealership. They generally aren't anxious to make the connection obvious.

Tractor Market Shares in France (First Half, 1986 vs. 1985)				
Tractor Make	Jan.-June		Market Shares	
	1985	1986	1985	1986
Fiat-Agri	2,704	2,854	13.2	15.6
Renault	3,212	2,361	15.7	13.8
Massey-Ferguson*	2,368	2,229	11.6	13.1
J I Case**	3,478	1,852	17.0	10.9
John Deere	2,029	1,756	8.4	10.3
Ford	1,309	1,217	9.9	7.2
SAME	909	875	4.5	5.1
Deutz	785	724	3.8	4.3
Other makes	3,668	3,559	17.9	19.7
Total	20,462	17,017	100.0	100.0

*Includes Landini. **Includes International Harvester.

Notes: Average horsepower sold is down slightly, from 73.2 in the first half of 1985 to 71.7 in the same 1986 period. The percentage of front-wheel-drive tractors sold runs constant at 65. In 1976, this sector was only 16.8 per cent of the market.

Incidentally, farm equipment retailing in France has one feature that you don't have in the United States. There are somewhere around 5,000 agents.

These agents are independents who usually live in the country and are very close to the farmers around them. They make machinery sales on behalf of the dealer and collect a few percentage points of commis-

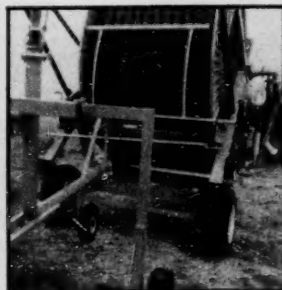
sion for their efforts. They don't normally stock parts or perform repair services.

And that's my capsule profile of the French farm equipment dealer and how he's making it today.

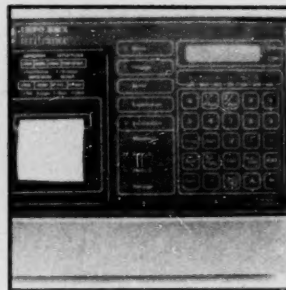
—Jean-Pierre Samson

(Editor's note: The writer is a journalist specializing in farm equipment topics and residing in Neuilly-sur-Seine, France.)

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Write in (58) on Reply Card

October 1986 Implement & Tractor F-3

French manufacturers export 40 per cent of product



True, this stamp isn't French, but it represents an export achievement of the French farm equipment industry. Mongolia likes its French-built Renault tractors enough to feature them on a stamp.

Dear Editor:

You're right, the French farm machinery industry is a major factor in Western Europe and, in some product categories, the world. In 1985, industry turnover was \$1.7 billion.

Several French manufacturers dominate or are major factors in Europe on such products as moldboard plows, hay mowers, hay balers, crop sprayers, sugar beet harvesters, grape harvesters and pneumatic drills.

France, which is the size of Texas in terms of square miles, presents a great variety of climate conditions, soil types, and types of crops and livestock. All this leads to an industry that manufactures a large breadth of equipment types.

To give you an idea of our major areas of activity, here are some 1985 production totals:

Product	Units Produced
Farm tractors	42,000
Plows, all types	21,000
Drills	7,100
Precision drills (row units)	52,000
Fertilizer distributors (liquid and solid)	7,900
Knapsack/portable sprayers	272,600
Engine/PTO-driven sprayers	21,500
Pick-up balers	11,700
Round balers	12,000
Front loaders	12,200
Barn cleaners	2,200
Manure spreaders	6,900
Grape harvesters	1,100

Export activity

French manufacturers have managed to raise their export activity considerably in recent years. In

1985, almost 40 per cent of turnover (\$662 million) was derived from exporting. By way of comparison, in 1971, 24 firms were able to derive 30 per cent or more of their sales from exports. By 1985, there were 53 companies above this level.

In 1985, the \$662 million in exports divided thus: \$346 million for complete tractors and their components; \$316 million for agricultural machines.

We do business in 130 nations, the major trading partners being in the European Common Market. But we have been increasing exports to other industrial countries, including the U.S., Canada and Australia.

The table of your French imports (our exports to the U.S.), as provided by the U.S. Commerce Dept., tracks closely to the data we have over here. We show exports to the U.S. at \$40 million in 1983, \$69 million in 1984 and \$63 million in 1985; your respective numbers are \$41 million, \$72 million and \$69 million.

I'm sending along a list of French based companies that are active in the U.S. farm equipment market, and their U.S. distributors or major customers.

— Bernard Decaens, SYGMA

(Editor's note: SYGMA, the trade association for French farm equipment manufacturers, is based at 19 rue Jacques-Bingen, 75017 Paris, telephone 47 66 0220. Bernard Decaens is an export specialist with the organization.)



Value of Major U.S. Farm Equipment Imports From France

(Thousands of dollars)

	1982	1983	1984	1985	First Half, 1986
All Products	\$30,804	\$41,333	\$72,605	\$68,681	\$42,987
Tractors, Ag	7,580	18,401	28,824	16,775	4,685
Tractors, Other Incl. Garden, Used	73	204	3,267	3,626	1,369
Tractor Parts	7,340	4,516	12,261	15,835	8,904
Mowers, excl. Lawn Mowers	5,108	5,610	11,658	12,064	10,067
Harvesting Machines	1,421	2,642	3,474	3,281	2,057
Parts for Harvesting Machines	1,014	515	1,078	3,373	5,853
Other Agricultural Machines	938	1,721	3,900	3,924	4,139
Parts for Other Ag Machines	1,784	1,515	3,286	3,254	1,302
Parts for Tillage Equipment	982	1,192	1,524	1,652	826
Haying Machines Excl. Mowers	563	2,915	1,185	817	277

Source: U.S. Dept. of Commerce, International Trade Administration, Office of Capital Goods & International Construction.

French products in America and their distributors or OEM customers

Berthoud S.A.
B.P. 36
69823 Belleville Cedex
Tel. 74 66 01 91

Agricultural sprayers

Berthoud Skibbe
3783 S. Pipestone
Sodus, MI 49126
Tel. 616-925-1871

Agrotec Inc.
Box 49
Pendleton, NC 27862
Tel. 919-585-1222

Bobard Jeune S.A.
B.P. 153
21204 Beaune Cedex
Tel. 80 22 25 50

High-clearance vineyard and nursery tractors

Otto Timm Enterprises
Box 157
Oakville, Ont.
Tel. 416-826-1333

La Buvette S.A.
15 rue de l'Arquebuse
08000 Charleville Mezieres
Tel. 24 32 61 22

Cattle waterers

Applied Sales Engineering
6124 Olson Highway
Minneapolis, MN 55422
Tel. 612-544-3308

Carroy-Giraudon S.A.
Z.I. Route du Foecy
18100 Vierzon
Tel. 51 07 82 35

Flail mowers

Distributors sought.

C.M.M.C. Vasilin
49290 Chalonnes
Tel. 41 78 22 44

Grape and wine processing equipment

Budde & Westermann
Box 177
Montclair, NJ 07042
Tel. 201-744-5363

F.P. Packaging
Box 881
S. San Francisco, CA 94083
Tel. 415-871-5497

Cerimon S.A.
B.P. 11
79320 Moncoutant
Tel. 49 72 61 25

Rotary trenchers

Cerimon Inc.
Box 3395, College Sta.
Fredericksburg, VA 22402
Tel. 703-898-1524

Pioneer Logging Machinery
Box 250
Lexington, SC 29072
Tel. 803-356-0123

Denis S.A.
28160 Brou
Tel. 37 47 05 08

Silo unloaders, rotary
extractors for material with
poor flow characteristics
Agent or dealers sought.

Ebra S.A.
B.P. 915
49009 Angers
Tel. 41 43 23 00

Reversible plows, other tillage
and planting equipment
Distributors or technology
transfer arrangements
sought.

Electro-Ecremeuse
45 Bd de la Republique
92100 Boulogne-Billancourt
Tel. 46 09 05 41

Cream separators, butter
churns, other specialized
dairy equipment

The Schlueter Co.
112 E. Centerway
Janesville, WI 53545
Tel. 608-556-1269

Femenia Fabrication S.A.
Z.I. de Tragone
20200 Biguglia
Tel. 95 33 50 81

Grape harvesters, brush-
cutting combine
Distributors sought

Forges de Niaux S.A.
Niaux
09400 Tarascon
Tel. 61 05 88 30

(Continued on page F-13)